# WIRED

MORE

## NEW RULES FOR STYLISH AND PROPER BEHAVIOR IN THE DIGITAL AGE

With Guest Glasshole

## JERRY SEINFELD

OUTDOOR GEAR EXTRAVAGANZA
GADGET
RIDE
CANOE
Expedition
GL
SURF
BIKE
LAB
36 ESSENTIALS FOR SUMMER

+

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**K900 V8 expected Spring 2014. Initially available in certain markets with limited availability.** K900 V8 with VIP package shown. Not all optional features are available on all trims. Some features may vary. *AMCI Testing Certified, comparably equipped MY 2014 vehicles: K900 VIP trim, Lexus LS 460 with optional air suspension.

kia.com/K900
K900 V8 with VIP package shown.
KIA

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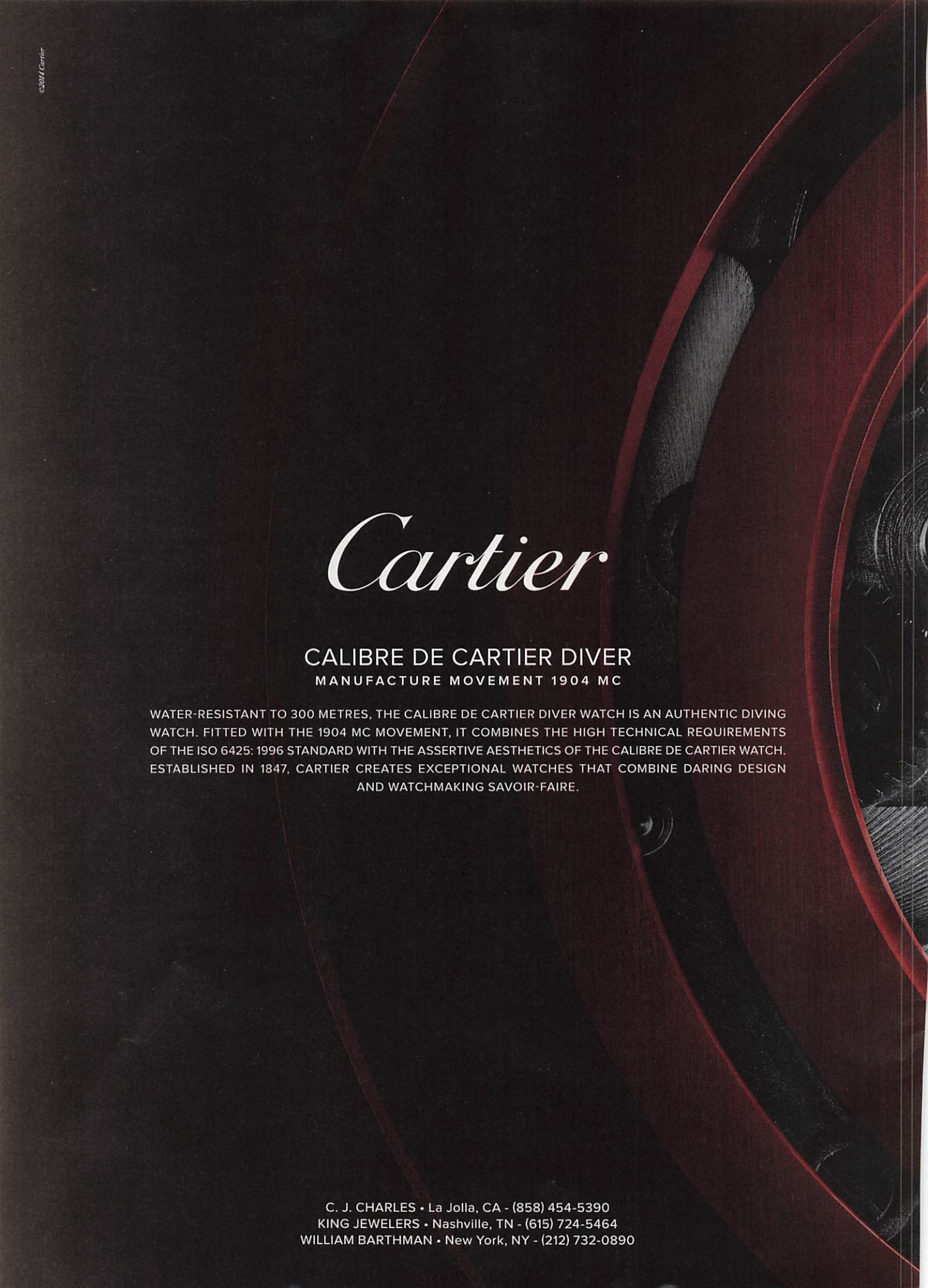

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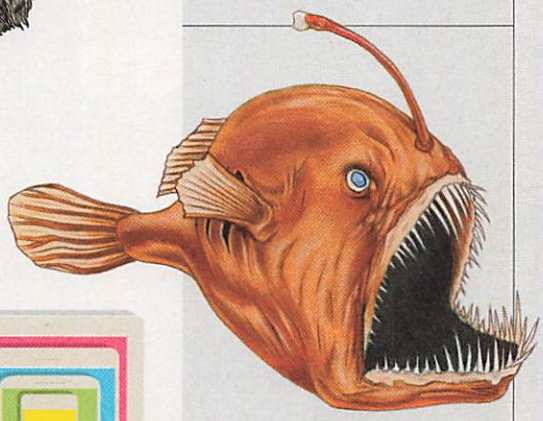


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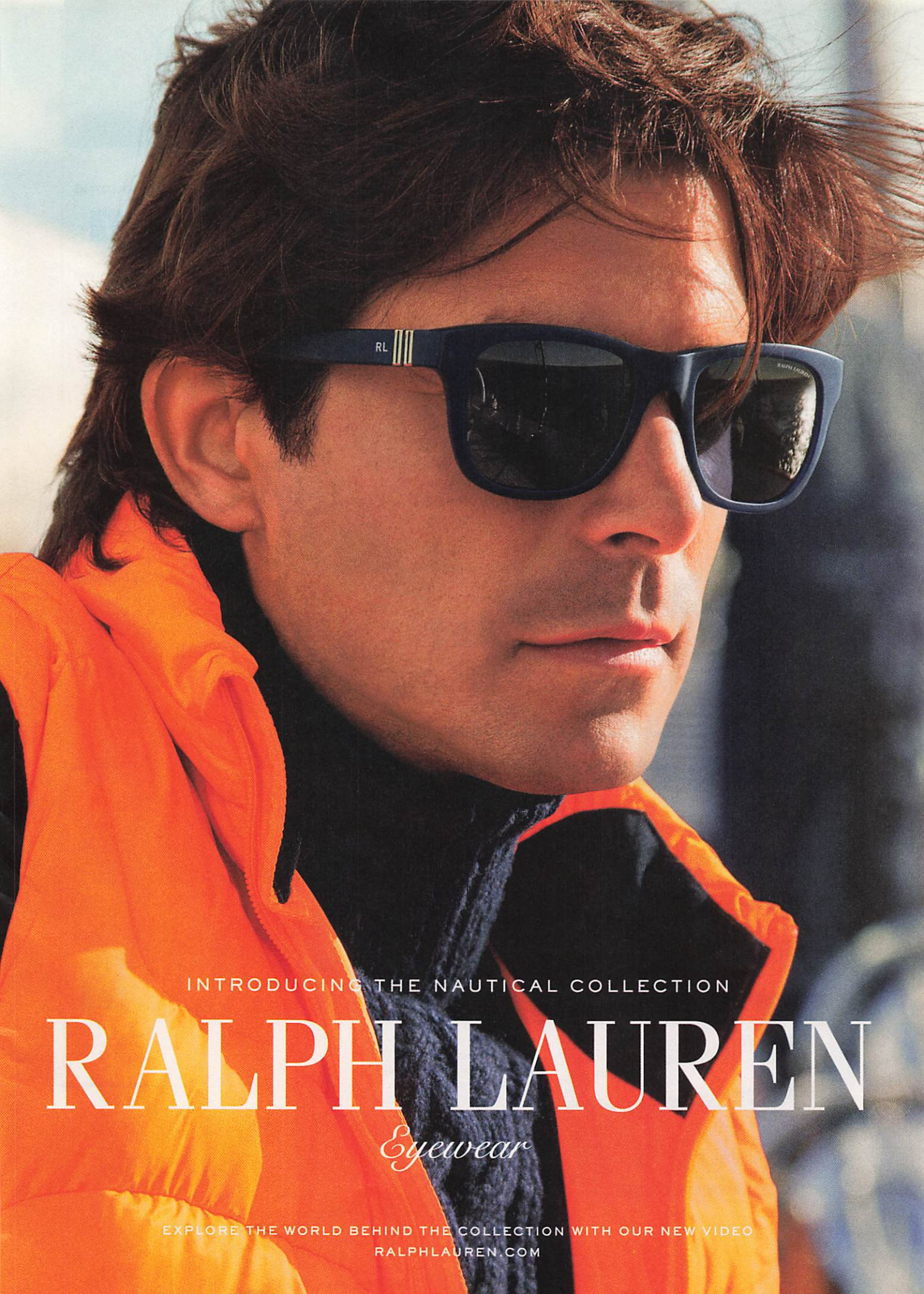
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# WEB

### The Comic-Con Crew

When summer rolls around, our thoughts turn not to backyard barbecues and pool parties but *Game of Thrones* star sightings and (fake) arms dealing. That's because July means Comic-Con, the biggest event a comics/sci-fi/anime/horror/gaming/manga/fantasy (whew!) fan could ask for. To keep up on all the news, from Hall H to the cosplay ball, tune in to our liveblog and follow the WIRED crew on Twitter.

**ON THE WEB:** WIRED.com/category/underwire

**ON TWITTER:** twitter.com/WIRED/lists/ComicCon2014

# WEB/VIDEO

## Ask Jerry

Forget the Modern Age! We've now entered the Annoying Age, according to Jerry Seinfeld, host of this month's guide to proper behavior in the WIRED world. Humblebrags? Google Glass? Tinder? Oh, come on. Watch Seinfeld share his advice (along with his bafflement) on the WIRED tablet app and our website.

### Innovation Insights

How empathy affects businesses, why creativity isn't solely the purview of the young, and how businesses should respect the power of the crowd: WIRED's Innovation Insights blog dissects these and other issues facing companies today.

**ON THE WEB:** WIRED.com/insights

# TABLET

## Expedition, Unabridged

For this issue's special Expedition Gadget Lab, we sent four writers on amazing solo adventures so they could put the latest outdoor gear to the test. Download the WIRED app for tablet or visit WIRED.com to read even more detailed product reviews and watch deputy editor Joe Brown flex his off-road motorcycling skills.

# WEB

### Summer of Binge-Watching

While your regular TV fare takes a holiday, cool off with a binge-watching marathon. This season, WIRED's Underwire blog provides a guide to how to binge properly, which seasons to focus on, and what characters to follow. Lost on how to survive *Lost*? Need a community to power through *Community*? Look no further.

**ON THE WEB:** WIRED.com/category/underwire

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USED THE FINGER PROTOCOL TO OBTAIN A CRUSH'S PHONE NUMBER (THEN TOLD HER ABOUT IT)

WAITED UNTIL 2010 TO GET A SMARTPHONE

STEADFASTLY REFUSED TO PARTICIPATE IN FARMVILLE CAMPAIGNS

CLICKED "REPLY ALL" DESPITE BEING SPECIFICALLY TOLD NOT TO

ADMITTING I STILL DON'T OWN A SMARTPHONE

TEXTED "I HAD A HOT DATE LAST NIGHT" TO SOMEONE I HAD JUST GONE ON A FIRST DATE WITH. INSTEAD OF MY BEST FRIEND

MUTED A CLIENT TO BAD-MOUTH THEM MID-CONFERENCE CALL

CONTRIBUTED TO A 600-PLUS EMAIL CHAIN REGARDING THE FINER POINTS OF COMPETITIVE KARAOKE

MEANT TO FORWARD A COWORKER'S EMAIL TO MAKE FUN OF HER ... BUT REPLIED TO HER

TEXTED "HAHA-HAHAHAHAHAHA-HAHA" INSTEAD OF "HAPPY BIRTHDAY" TO AN ACQUAINTANCE. THANKS, AUTOCORRECT!

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UPLOADED A PHOTO OF MY CRUSH AS MY OWN FACEBOOK PROFILE PICTURE. LET'S JUST SAY WE NEVER DATED.

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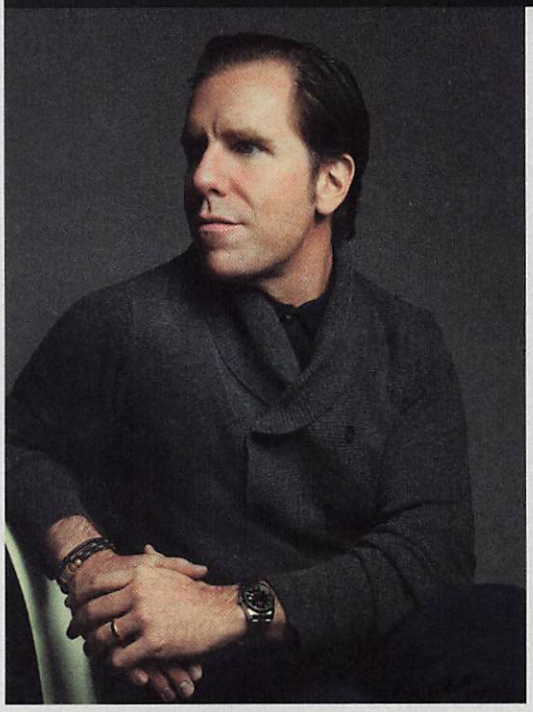


**WHEN YOU GROW UP** in West Texas like I did, manners matter. A lot. Even as a toddler, I was taught to always address my elders as "ma'am" and "sir." As in:

"Put your Boba Fett away while you're at the dinner table."

"Yes, ma'am."

"Your mother asked you to put the doll away."

"Yes, sir."

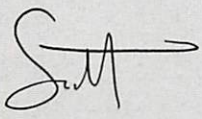
It turns out that this emphasis on etiquette goes back to Texas' frontier days. My rough-and-tumble forebears were similarly obsessed with politesse and constructed all manner of arcane rules to govern their interactions, from the sensible (don't squat in spurs) to the execrable (a woman never spits). You don't usually associate cowboys with such refinement, but in a way it makes sense. Texas was rugged country, settled by hardy pioneers from distant lands who were plotting their own futures. Settler to settler, they faced a new frontier and created rules to instill order and connect with one another.

Today, as technology pioneers, we're forging our way through some thorny frontiers of our own. We are inundated with new gadgets, services, apps, messaging, games, and media. We're doxxing, vaping, and Lyfting. We're strapping sensors to our wrists and hanging screens on our faces. And like those early Texas settlers, we are also going to have to figure out the rules of the society we're building. Is it OK to play *Candy Crush* on the toilet? Mind if I answer this email during dinner? Can I borrow your Netflix password again? To put it in language a ranch hand could appreciate: Shit is fucked up.

But it doesn't have to be. Yes, it's true that new, popular technologies always bring new social mores. (Use your turn signal! Share the remote! Don't listen to headphones with the volume too high!) And just when they get codified, some newer technology disrupts the rules all over again. But without good manners, we're just the apes in Kubrick's *2001*, using the latest technologies to beat each other's brains out.

My Texas upbringing tells me it doesn't have to be this way, and WIRED's keenest observers of human nature—with some backup from Jerry Seinfeld (thanks, Jerry)—confirm that intuition in this very issue. New gadgets and new ways to communicate saturate our lives, but they don't have to turn us into cyborgs or, even worse, jerks.

So please: Don't chew with your mouth open. Don't live-tweet a funeral. You're welcome.



SCOTT DADICH
Editor in Chief

**WHERE TECHNOLOGY GOES, NEW RULES FOLLOW**

**1876**
Never use a typewriter for a personal letter. Write it by hand.

**1877**
When answering the telephone, say "Hello!" (Alexander Graham Bell had proposed "Ahoy!")

**1928**
When composing a telegram, it's OK to omit "Yours very truly."

**1984**
When friends arrive, turn down the TV and greet them.

**1997**
Don't use BCC to keep others from seeing who you are copying on an email (unless it's a mass email).

**2000**
You are not obligated to forward a misdirected fax.

**2003**
Avoid butt-dialing with cell phones—911 has more pressing calls to handle.

**2011**
When mentioning a news article on Twitter, always include a short URL.

**2014**
Always remove Google Glass before entering a locker room.

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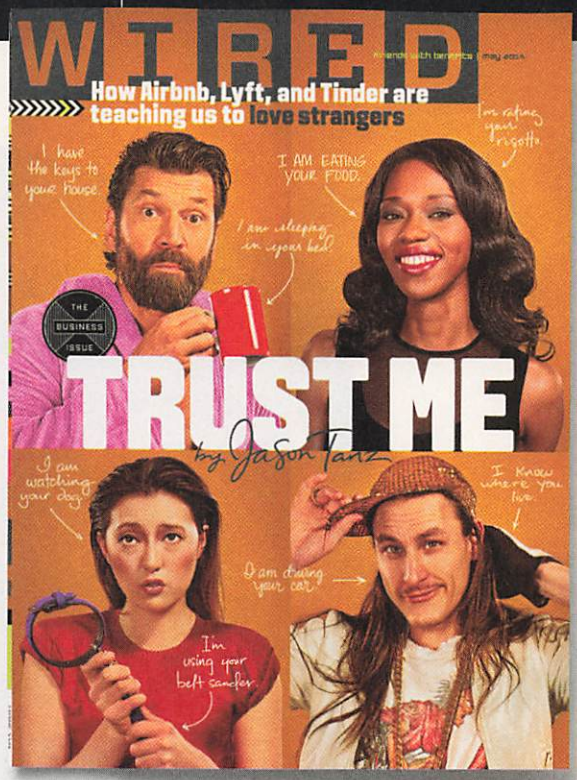
# STRANGER DANGER

**GROWN-UPS KNOW** that outsiders aren't all that scary. We ride in cabs, go on blind dates, and buy things on Craigslist. Now companies like Lyft, Airbnb, and Tinder are trying to capitalize on our credulity and make us feel comfortable with sharing and swapping our most precious resources (cars, spare rooms, love, lust) with virtual unknowns. Jason Tanz, WIRED's executive editor, argues that this effort has brought about a "digital re-creation of the neighborly interactions that defined pre-industrial society." Back then, you couldn't give your stagecoach driver a star rating, but you could spread your sentiment via word of mouth. Today, it's way easier; we're all town criers with smart megaphones.


WIRED
How Airbnb, Lyft, and Tinder are teaching us to love strangers
THE BUSINESS ISSUE
TRUST ME
by Jason Tanz
I have the keys to your house.
I AM EATING YOUR FOOD.
I am sleeping in your bed.
I'm rating your risotto.
I am watching your dog.
I am using your credit card.
I'm using your bed sanded.
I know where you live.

RE: "JUICED": INSIDE THE INDUSTRIALIZATION OF WINE

## "A $2 WINE THAT DOESN'T MAKE PEOPLE VOMIT IS A TESTAMENT TO SCIENCE AND ECONOMICS."

ucdwino on WIRED.com

RE: "BEAT THE DEVILS": ROOTING OUT ONLINE HARASSMENT

"It is surprising to me how many people (mostly men) are so devoted to having public places on the Internet as their own personal thought toilets. Some social situations tend to run hot, like videogames and certain city council meetings. But it's time to reel in the abuse. The Internet is real life, and who you are here reflects who you really are."
**Heidi MacDonald on *The Beat* (comicsbeat.com)**

"As an educator and someone who plays a lot of online PC games, I think that reputation systems are a great thing so long as there is a mechanism in place to encourage a correction in future behavior. Any system that allows for people to trash their own online reputation should also have a path to salvation."
Bearpants42 on WIRED.com

"Clearly, services like Airbnb enable new kinds of exchange—but not because we trust each other. These tools are designed to prevent misbehavior, to give people information about their transaction partners, and to provide a safety net when things go wrong. Accountability is a *substitute* for trust."
Karen Levy, via email

RE: "ATTACK OF THE SARCASTIC ROBOTS": AN ORAL HISTORY OF *MYSTERY SCIENCE THEATER 3000*

"The original *MST3K* aired on obscure channels that only people with giant satellite dishes received. It was a time when being a geek actually meant something. Let us cherish those days."
irrationalNumber on Reddit

RE: "NO EXIT": FEAR AND LOATHING IN SILICON VALLEY

"Living in a repurposed warehouse and subsisting on ramen seems a high price to pay to be physically close to something that mainly lives as an idea in young people's minds. The most ironic thing is that those who reap the most benefits of living in Silicon Valley are the ones working for big, established companies."
VexXtreme on Hacker News

**UNDO**

Joel Hodgson graduated from college in St. Paul, Minnesota, not Minneapolis ("Attack of the Sarcastic Robots," issue 22.05).

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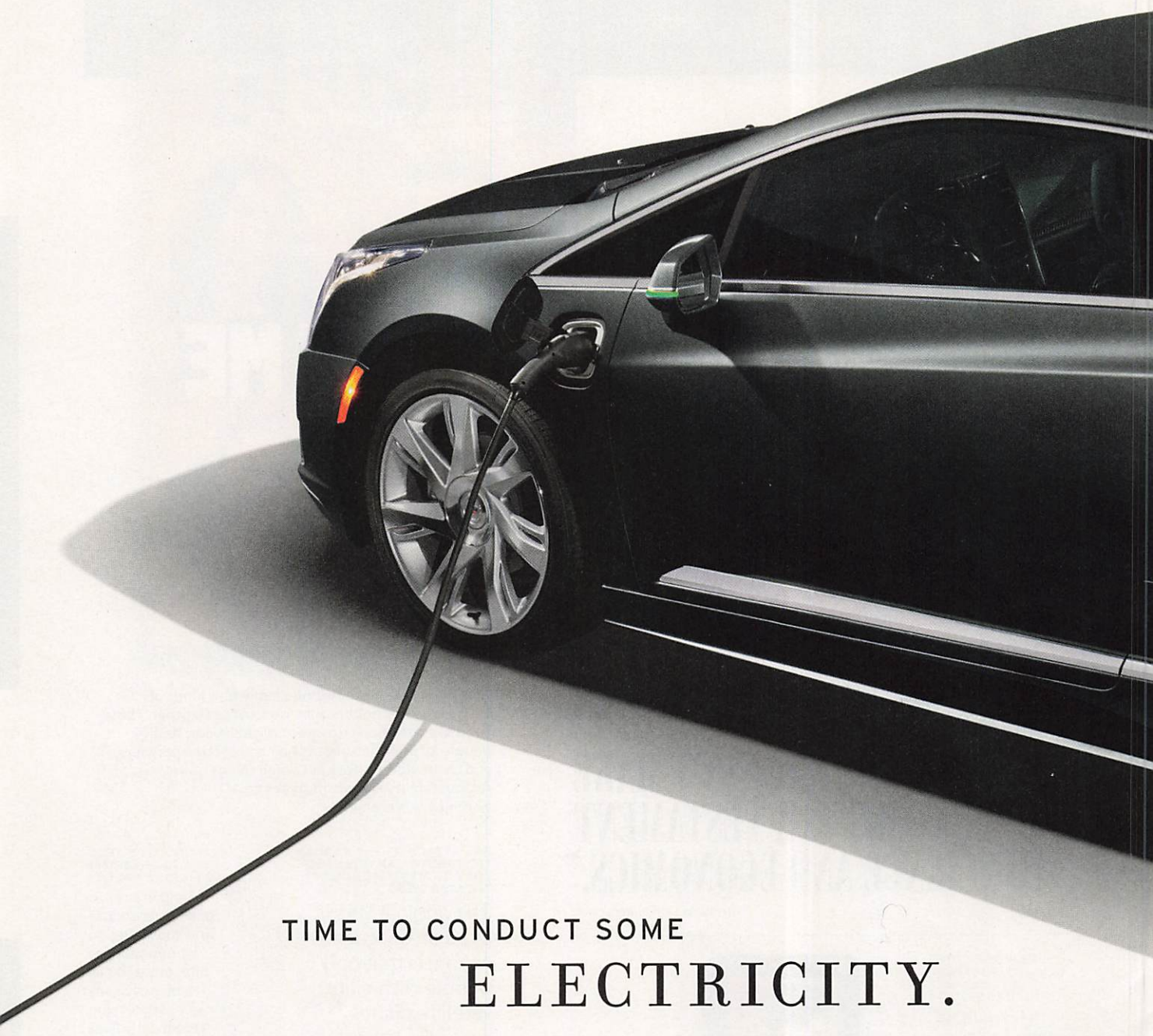

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# WHERE HIP HOP FLOWS IN THE U.S.

**Spotify data proves that East Coast rap claims the biggest territory.**

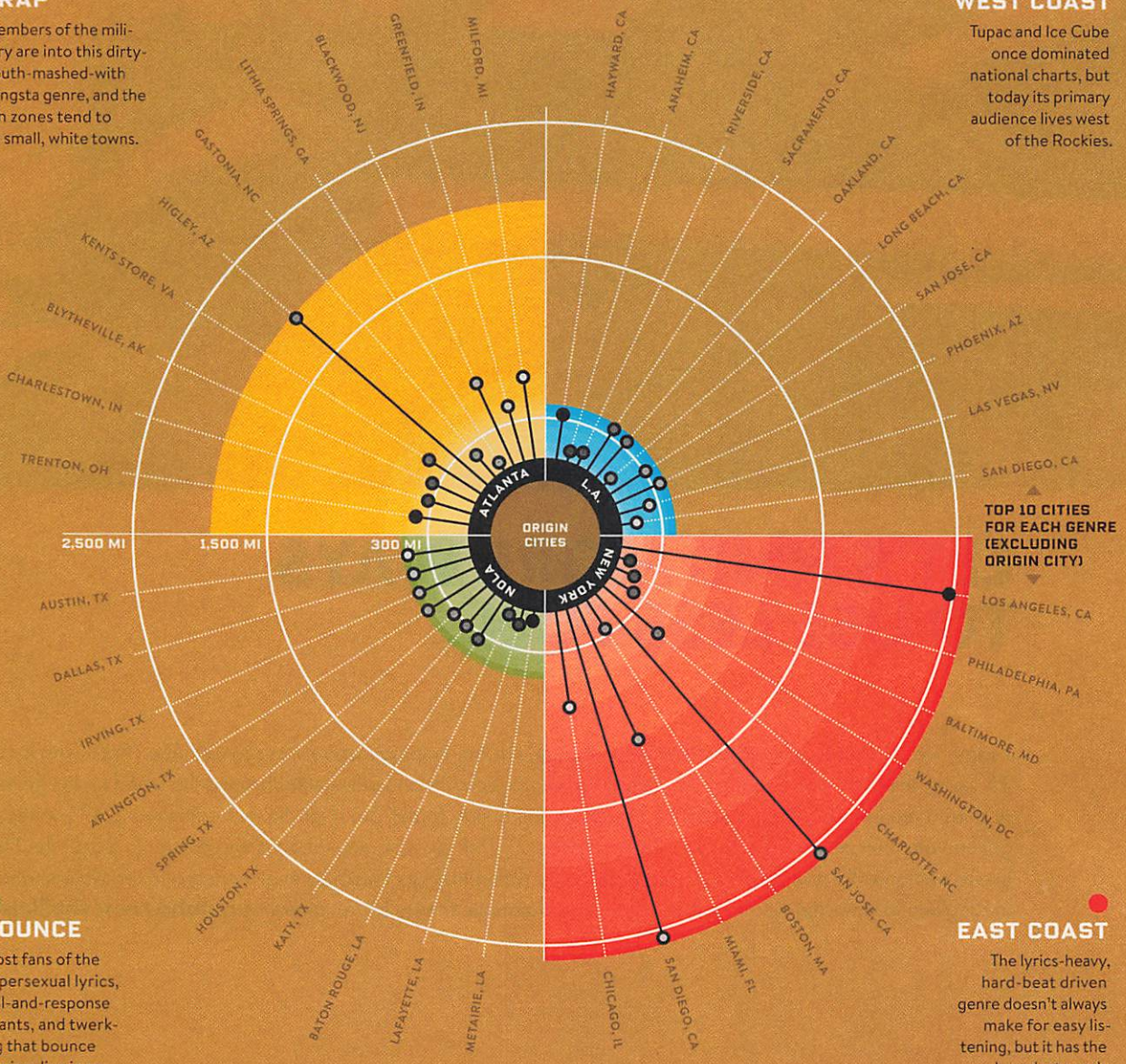
East Coast hip hop groups like the legendary Wu-Tang Clan have fan bases that reach far beyond Shaolin (that's Staten Island). A huge portion of their fans hail from California. But a lot of hip hop subgenres (bounce, trap, crunk, jerk) stick close to home; even West Coast hip hop skews local. To figure out how far the music's many branches spread, Glenn McDonald, data scientist at music intelligence service Echo Nest, used numbers from Spotify (Echo's corporate parent) to quantify where the fans are. —GRACE DOBUSH

## TRAP

Members of the military are into this dirty-South-mashed-with gangsta genre, and the fan zones tend to be small, white towns.

## WEST COAST

Tupac and Ice Cube once dominated national charts, but today its primary audience lives west of the Rockies.




## BOUNCE

Most fans of the hypersexual lyrics, call-and-response chants, and twerking that bounce inspires live in or near New Orleans.

## EAST COAST

The lyrics-heavy, hard-beat driven genre doesn't always make for easy listening, but it has the broadest reach.

**POPULARITY (LISTENERS/POPULATION)**

10TH-RANKED CITY ○ ○ ○ ○ ○ ○ ○ ○ ○ ● TOP-RANKED CITY

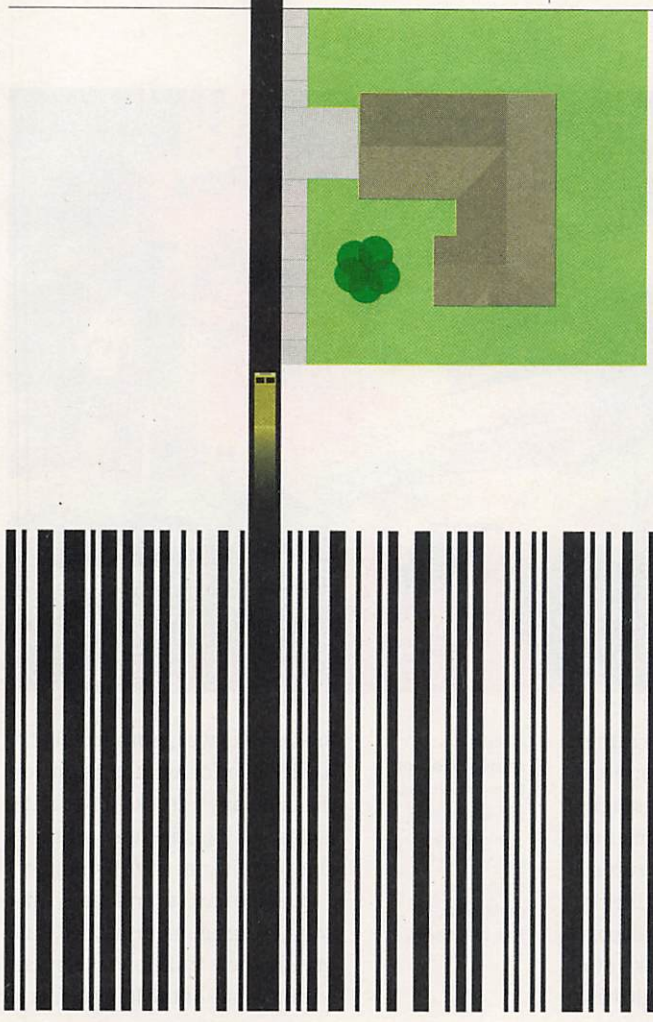
Source: Echo Nest

# LET'S FIND MORE WAYS TO USE LESS FUEL.

Today, we're not only working to find more energy, we are helping inspire ways to use less. That's why for over 25 years, the Shell Eco-marathon has been challenging schools and universities around the world to design, build and test ultra-energy efficient vehicles. At this year's event, Mater Dei High School achieved 2,471 miles per gallon with their prototype vehicle, "Supermileage 2." This spirit of innovation is spreading. In 2015, the Shell Eco-marathon will move to Detroit, Michigan, a city with a history of mobility engineering and innovation, and an ideal place to drive the world further toward a sustainable energy future. **www.youtube.com/shellletsgo**

**LET'S GO.**

BY MARCUS WOHLSEN



# GROUND WAR

## TECH TITANS TAKE THEIR FIGHT TO THE STREETS

**CONVENIENCE STORES** are a trillion-dollar industry worldwide, despite the fact that they're not actually very convenient. In principle, at least, 7-Elevens have been optimally spread throughout your region and optimally stocked with items you want in a pinch. But with their limited footprints, they can't stock nearly enough items to satisfy everyone. And given that you probably need to drive there anyway, you might as well travel the extra 10 minutes to the supermarket or big-box retailer that has what you really want.¶ True convenience shopping is on its way, though, and we won't need to drive at all to enjoy it. Instead, the store will come to us: Within five

ARTICLE

years, the majority of items we crave on short notice—ice cream, books, umbrellas, lightbulbs—will be available for delivery the same day. This will be enabled, in part, by better interfaces (speech-recognition apps for ordering items by voice alone, sensors in fridges to guess what we'll need before we even realize it) and by better data analysis. But the most crucial change will be in the streets: fleets of delivery vehicles that strategically traverse the roads of cities and suburbs, stuffed with the items that retailers' algorithms will predict we want.

Of course, the 7-Elevens of the world probably won't be the companies to achieve this. Big tech firms—most of which built their multibillion-dollar businesses on moving weightless bits around—are now racing to make this sci-fi vision a reality. Just as getting those bits the "last mile" into homes and businesses was the defining technology challenge of the '00s, so getting actual stuff the last mile will be the tech challenge of this decade. In short, logistics—the tech industry's boring sideshow—has emerged as its central drama.

**IT'S HARDLY A SURPRISE** that Amazon is the farthest along in building this future. Back in the early days of the web, when everyone else was trying to figure out how to make the Internet work better in and for itself, Jeff Bezos was already trying to make it work for the world of physical retail. To move stuff at the speed of the Internet—that is, as fast as possible—the Amazon founder realized he needed to think algorithmically about order fulfillment. Amazon reengineered its distribution centers according to rules that make computer sense rather than common sense. Inventory is stored not by category but simply by whether a shelf has room. And multiples of the same item aren't stockpiled together; instead they're dispersed throughout a warehouse, to minimize the distance workers (or robots) have to travel through these monumental million-square-foot facilities. All told, Amazon's reinvention of the warehouse is arguably a logistical advance on par with the shipping container or the bar code.

Amazon's reinvention of the warehouse is a logistical advance on par with the shipping container or the bar code.

**THESE TRUCKS COULD EVEN CARRY PRODUCTS THAT YOU HAVEN'T ORDERED BUT THAT AMAZON'S ALGORITHMS PREDICT YOU PROBABLY WILL.**

But the ambition of what Amazon has done inside its warehouses is nothing compared to what it's now trying to do beyond those walls. On the streets of several US cities, lime-green trucks emblazoned with the AmazonFresh logo deliver groceries the same day they're ordered. And food is just a wedge product that, if it catches on for Amazon, could turn the company's trucks into roving nodes on a logistics network that's able to deliver nearly anything.

Over the past several years, Amazon has foregone profits to fund massive new "fulfillment centers" within range of the largest metro areas in the US. Once reluctant to set up operations in states such as California that would force it to collect sales tax, Amazon is now betting that proximity to its customers will lure them into ordering more, enticed by the sheer speed with which their every shopping whim can be fulfilled. And there's every reason to think the gambit will work. Unlike the first generation of delivery debacles (such as Kozmo and Webvan), Amazon has spent 20 years perfecting warehouse management and achieving the economies of scale required to make same-day delivery work. And while the retail world's other logistical powerhouse, Walmart, could become a viable competitor, only Amazon among all its rivals has always operated as a technology company first.

**MARCUS WOHLSEN** (@marcuswohlsen) *is a* WIRED *senior writer.*

PHOTO ILLUSTRATION BY GLUEKIT; ALL IMAGES ALAMY; MIDDLE TRUCK: CORBIS; RIGHT TRUCK: GETTY IMAGES

psst...
up here.
it's amazing what can happen when your head's in the clouds.
we looked up and saw a different way to purify water.
by vapor-distilling it, so it's pure and crisp like from a cloud,
then adding electrolytes for a distinct taste.
what will you see when you look up?
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For Amazon, the endgame is nothing less than ubiquity: a fleet of trucks to serve as a 21st-century version of the milkman and the mail carrier combined. Amazon trucks could become a daily presence on neighborhood streets, delivering nearly anything the online retailer sells—which is almost everything. These trucks could even wind up carrying small aerial delivery drones—of the sort that Bezos touted, to much incredulity, on *60 Minutes* last year—as well as products that you haven't ordered but that Amazon's "anticipatory package shipping" algorithms (a concept the company patented in December) predict you probably will.

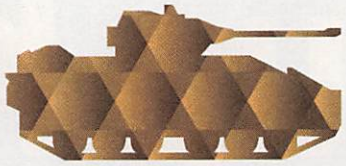
All of the technologies to make that future possible already exist; it's just a matter of putting the pieces together. And Amazon is hardly the only company with the potential to pull it off. Think about Google, whose acquisitions and big experimental projects over the past year—robots, drones, self-driving cars, same-day delivery shopping—seem to be aimed at building a physical platform for its machine intelligence expertise. Meanwhile, Google's main online business, search, has focused on using artificial intelligence to anticipate users' information needs before they even ask. If Google could combine those two strengths into a kind of Google Now for stuff, it would have most of the necessary tools for taking on Amazon in the streets. And in the process, it would bring customers back to Google to search for products its advertisers sell, rather than heading straight to Amazon to buy them.

**YES, THERE IS A LIMIT** to what high tech logistics can accomplish. Same-day delivery might never be possible everywhere, for example, and the carbon footprint of the system can't be wished away. But the improvement that such a system will represent over our convenience-store present will still be remarkable. Amazon is promising more than 500,000 different items available for same-day delivery through its current experimental program, while the biggest big-box superstores carry about 150,000. True, this is still just a small fraction of the hundreds of millions of items Amazon sells—but as the company's infrastructure expands, and its algorithms get better at shuffling merchandise according to patterns of demand, the portion of items available will radically expand as well. Both the beauty and challenge of same-day economics for Amazon is that the more the system gets used, the more efficient—and therefore affordable—it becomes.

Over time, the network of trucks can become a kind of ambient consumer layer, rendering brick-and-mortar retail ever more superfluous. In the process, as with the spread of broadband, these new delivery platforms will create multibillion-dollar businesses not just for the companies that control the platforms but also for companies that sell through them, hiring those ubiquitous trucks to ferry their own products, services, things we haven't even thought of, right to your doorstep. For that future to arrive, we just need to solve the new last-mile problem—and a solution may be right around the corner. W

**LOGISTICS HAS ITS LIMITS: SAME-DAY DELIVERY MIGHT NEVER BE POSSIBLE EVERYWHERE, AND THE CARBON FOOTPRINT CAN'T BE SIMPLY WISHED AWAY.**





# JARGON WATCH

### chameleon crystals
**n. pl. / kə-ˈmē-ˌlē-ən ˈkris-təlz /**

Crystals that form in ultraviolet light. In theory they have the potential to temporarily change the color of the surface on which they assemble. Because the crystals are transient—reverting to tiny latex particles in the dark—they could someday provide active camouflage for military vehicles.

### gynosome
**n. / ˈgī-nə-ˌsōm /**

A female penis. Unique to Brazilian cave insects, the spiked organ becomes erect when the female mounts the male, holding him captive for up to 70 hours of copulation.

### pixelbots
**n. pl. / ˈpik-səl-ˌbäts /**

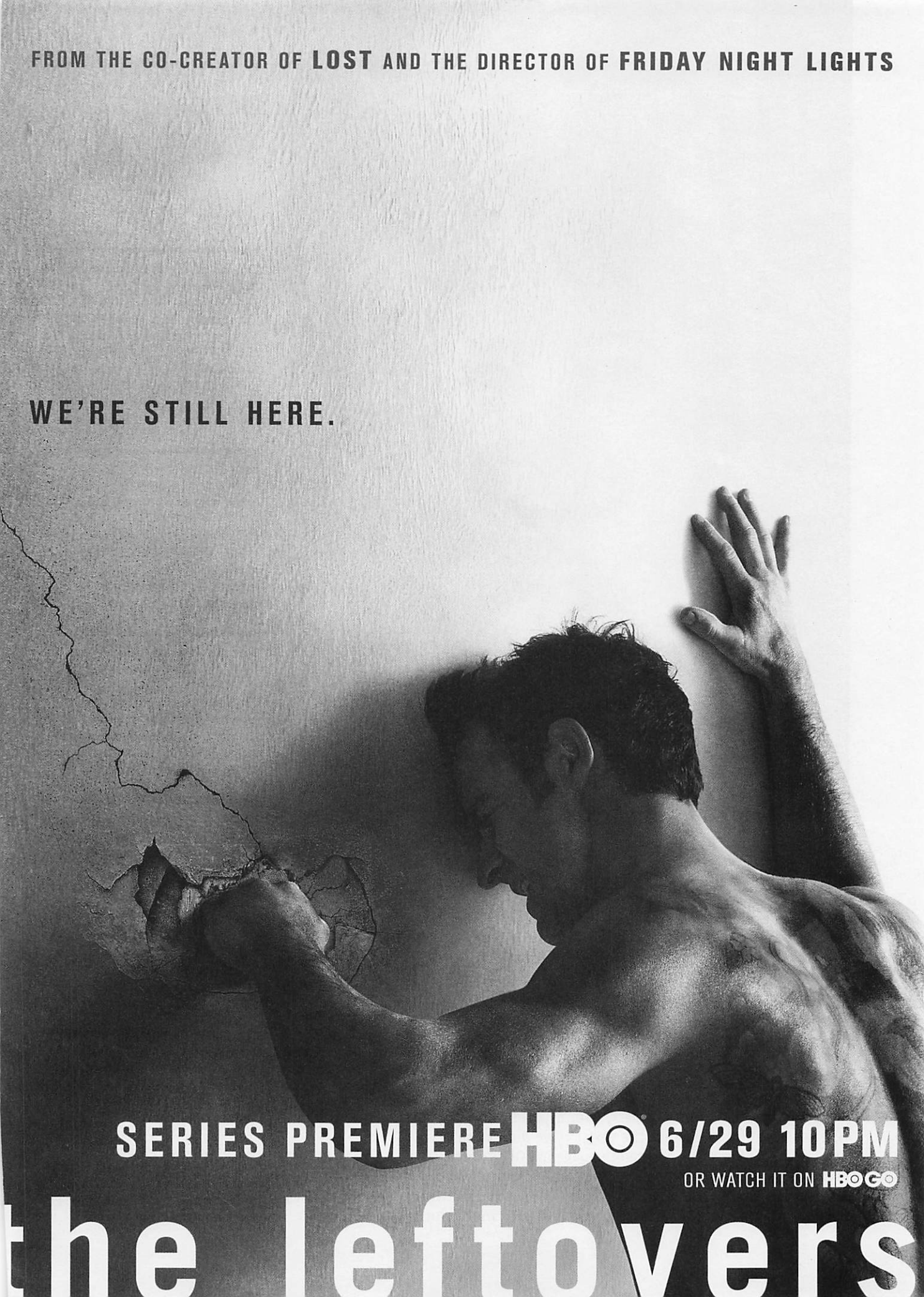
Miniature illuminated robots that swarm in computer-coordinated configurations to produce ultralow-res animations. Developed by Disney, pixelbots contain an adjustable-color LED and magnetic wheels that allow them to drive on walls.

### perceptronium
**n. / ˌpər-cep-ˈtrō-nē-əm /**

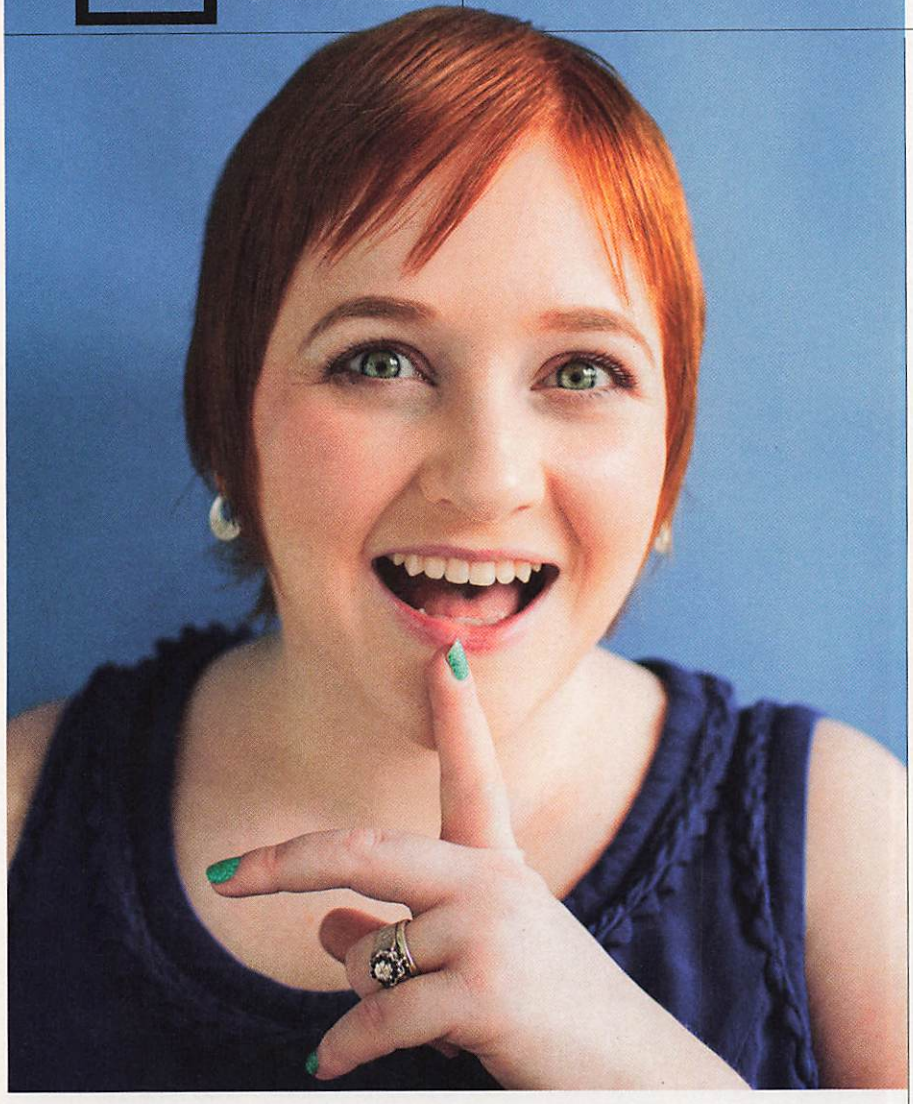
A hypothetical form of matter that possesses a sort of consciousness. According to MIT physicist Max Tegmark, like all matter perceptronium has physical properties. This brain-like substance could someday be manufactured for use in computers.

—JONATHON KEATS
*jargon@wired.com*

THOMAS POROSTOCKY


FROM THE CO-CREATOR OF LOST AND THE DIRECTOR OF FRIDAY NIGHT LIGHTS
WE'RE STILL HERE.
SERIES PREMIERE HBO 6/29 10PM
OR WATCH IT ON HBO GO
the leftovers

BY TIFFANY KELLY | CHRISTOPHER WAHL



# F**KING SCIENCE
# ELISE ANDREW LOVES IT

**THIS 24-YEAR-OLD** biology grad is luring the meme generation to science. Her own obsession began when *Jurassic Park*'s dinosaurs terrified and enthralled her at 5 years old. Now more than 15 million users follow Elise Andrew's Facebook page, I Fucking Love Science. Her posts grab readers' attention with a photo or an illustration accompanied by a funny, often dark caption. (Picture a smiling bee with the text, "If we die, we're taking you with us.") Since she created the page in 2012, Andrew has expanded to other platforms, including a stand-alone news site and an upcoming Science Channel show starring Craig Ferguson. You'll laugh, you'll cry, you'll beg for more sloths.

**Do you cover one topic more than others?**

I studied genetics, evolution, and biology, but I try to be as broad as possible. I do have to catch myself, because I get really excited about new findings in biology and I'll realize, oh crap, I just posted five new bio stories, I should probably post about physics.

**Your TV show will be an hour of live action and animation. What else can you tell us?**

I won't be in front of the camera, just helping guide the content. The focus will be the same as the Facebook page—entertaining but informative. I really clicked with Craig when I met him.

**Does science have to be light and funny to be appealing?**

I'm just trying to provide that first moment of interest, that spark. I do think that has to be light because it's supposed to grab you and drag you in. The posts are a gateway drug to science.

**You've taken heat for posting art without attribution. Do you have a process now for crediting artists?**

I'm always careful now to give credit, and I fix problems when I see them. In the early days of the Facebook page, I wasn't as thorough, because for a long time it didn't cross my mind that IFLS was a big deal. It was just my hobby.

**Your favorite post is one about sea otters that forcibly mate with baby seals, killing them. Why does that story stand out?**

People have a tendency to romanticize nature, and I think this post destroys that notion quite nicely. Nature is not your friend; nature is scary. Nature will fuck you up.

ILLUSTRATION BY TIM ENTHOVEN

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Samsung KNOX

Samsung GALAXY S5

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# EXPECT MORE FROM YOUR DEVICE: 4 REASONS TO GET THE SAMSUNG GALAXY S5

## ULTRA POWER SAVING MODE

Is that a heavy external battery pack in your pocket? Seriously? Yeah, you need to learn about Ultra Power Saving Mode that lets the Samsung Galaxy S5 stay on for up to 24 hours when you have 10 percent battery life. Instead of carrying around clunky cords, it's like the Samsung Galaxy S5 has a built-in generator that won't quit. The Samsung Galaxy S5 will keep running just as fast as you do. Other smartphones can be unreliable when their batteries drain leaving you without any connection to important calls, emails, and messages. Now you don't need to have a panic attack when your battery runs low. The Samsung Galaxy S5 knows how to conserve energy by switching to a black and white screen and only running essential apps.

HDR OFF

HDR ON

## HDR (Rich Tone)

Have you ever taken a picture of what looks to be the most perfect day at the beach, only to realize it's ruined because of the sun's unforgiving glare? You need a low-maintenance smartphone that produces brighter and vivid captures. With the Samsung Galaxy S5, you get just that by simply turning on the HDR when there is a strong counterlight or when a subject is shaded. The real-time preview allows you to view the image with shadow-free, natural light—as you get ready to take your next vivid and clear shot.

## DUST & WATER RESISTANT

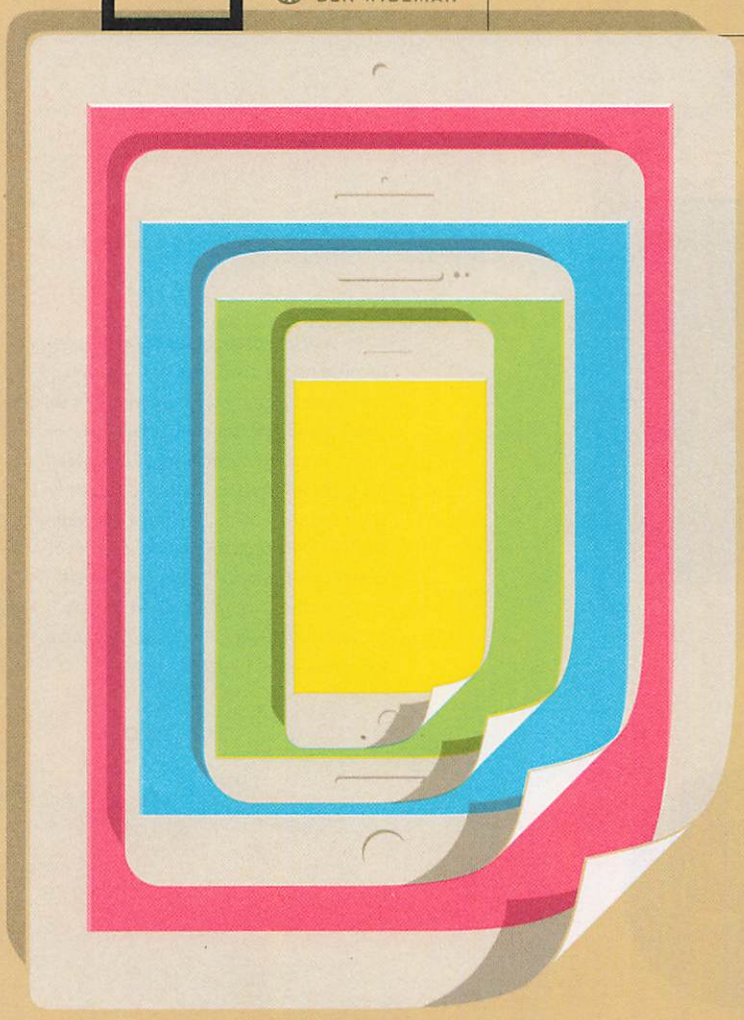
When your friends suggest a day at the pool or a game of pickup football in the park, you don't want to be the one worrying about your delicate smartphone. The Samsung Galaxy S5 isn't just smart, it's tough. With an IP67 certification, it's resistant to sand, dust, and liquids (yes, even sweat). In fact, it's almost like swinging shut the door on a submarine. Even if your day doesn't take you to Atlantis, you can still be ready for the most unexpected situations with the Samsung Galaxy S5 that's designed to last longer and stay stronger.

## HEART RATE SENSOR

Some smartphones make people lazy, but not the Samsung Galaxy S5 with the first-ever built-in heart rate sensor and S Health app that lets you track fitness goals, get on-demand nutrition info, use a pedometer, and more. It's like having a personal trainer with you at all times. Stay ahead of the pack and get in shape with a smartphone that is designed to make you smarter—and healthier. The Samsung Galaxy S5 will get you into high gear and remind you when it's time to work out.

Samsung GALAXY S5

BEN WISEMAN



# DIVIDE AND CONQUER
## THE PLEASURES OF THE MULTISCREEN LIFE

**IN HER ROLE** at MaRS Discovery District, a startup incubator in Toronto, Karen Schulman Dupuis reads 10,000 to 15,000 words a day onscreen. But she finds that impossible on her laptop, with all the email barking for her attention. "I need to put myself in a situation where I can really focus," she says. So when she gets to a long article, she uses a browser shortcut to send it to her iPad. All day long, she'll switch back and forth from one screen to another, shifting between reading and communicating. ¶ She's not the first to hit on this strategy. Now that people have several devices at work—a laptop, a phone, a tablet—they're finding their way to a similar trick, where they use each piece of hardware for a different purpose. Consider it a new way to manage all the digital demands on our attention: Instead of putting different tasks in different windows, people are starting to put them on different devices. ¶ Like Schulman Dupuis, many people have adopted the multiscreen approach to beat back distraction: Paul Bridger, a startup founder based in Europe, says he uses social apps like Twitter only on his iPad Mini so he won't be seduced by them on his laptop. For Doug Belshaw, a web-literacy lead for Mozilla, it's about making multiple tasks quickly glanceable. He puts to-do apps on a tablet that he keeps next to his desk like a physical calendar. "Ideally, I'd have a separate device for every activity," he says.

At the heart of this multiscreen life is a counterintuitive realization: that a profusion of devices can help focus one's attention rather than fracture it. A pile of browser tabs on your laptop becomes mentally confusing; tasks get hidden and maybe forgotten. But when screens are physically separate, the problem evaporates.

In a sense, screens are beginning to absorb some of the cognitive ergonomics of paper, one of the oldest reading devices of all. With paper, after all, we've always put down one document and picked up another, shifting our attention organically. And as Abigail Sellen and Richard Harper note in *The Myth of the Paperless Office,* spreading out papers on a desk lets our eyes easily roam—a property hard to replicate on a single screen. Now the plunging price of hi-res mobile devices means it's possible to own a few of them.

This trend is only going to accelerate as screens become ever more paperlike—smaller, cheaper, lighter, even bendable. Sony this spring unveiled a thin E Ink display that lets you scribble on digital documents just as you would on paper. And a lab at Queens University in Ontario has produced a remarkable prototype it calls PaperTab, a screen that has the size, thickness, and flexibility of a regular sheet of paper.

Of course, there's no guarantee that a welter of screens will improve our focus: If we don't use them mindfully, multiple devices could shred our working hours just as capably as the jumble of tabs does today.

Nonetheless, all these experiments in device-juggling point the way toward a weird and welcome technological future—in which our desks are piled with screens but our workload somehow feels lighter. W

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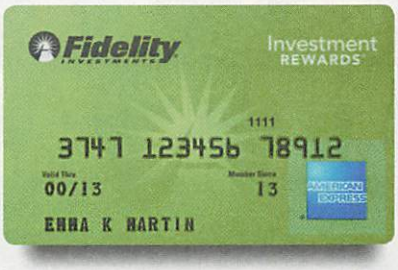


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COST TO ATTEND THE FOUR-DAY MILITARY-TRAINING CAMP AT COVERT OPS MIAMI
..... p. 44

**515**
DAILY TAKEOFFS AND LANDINGS AT SAN DIEGO'S LINDBERGH FIELD, THE BUSIEST SINGLE-RUNWAY AIRPORT IN THE U.S.
..... p. 42

PERCENTAGE OF HUMANITY THAT DISAPPEARS IN *THE LEFTOVERS*
**2%**
..... p. 40

**TWENTY-EIGHT**
WEEKS BETWEEN THE RELEASE OF THE MOVIES *THE LEGEND OF HERCULES* AND *HERCULES*
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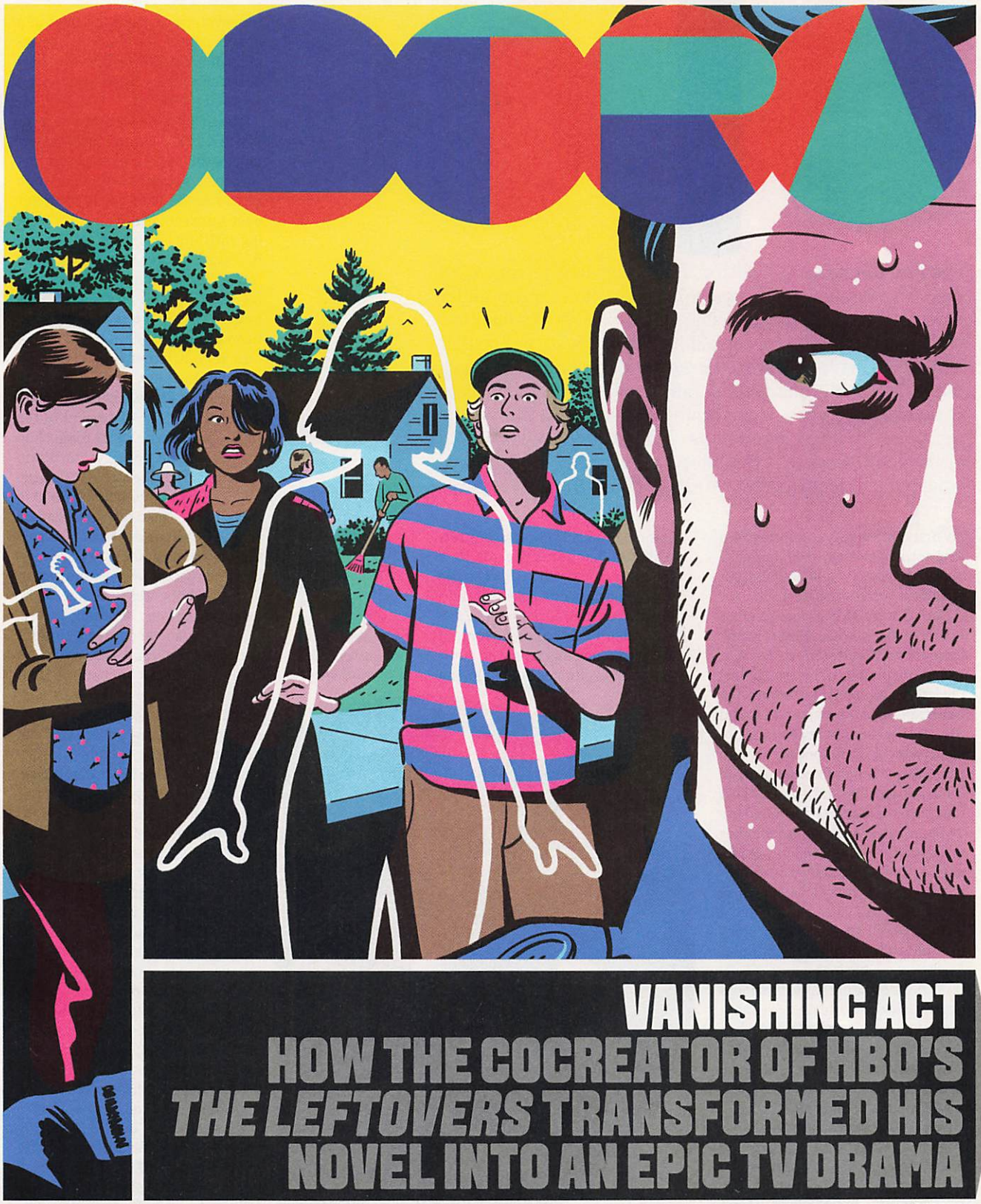


# VANISHING ACT
## HOW THE COCREATOR OF HBO'S *THE LEFTOVERS* TRANSFORMED HIS NOVEL INTO AN EPIC TV DRAMA

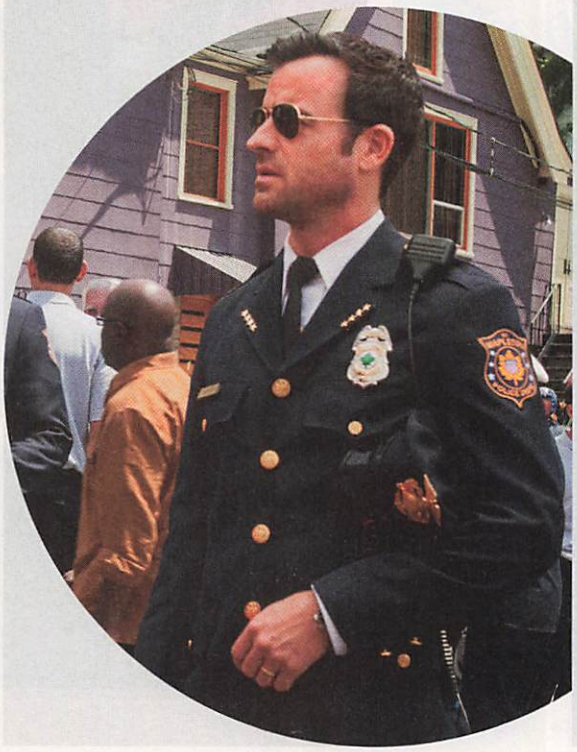


BY TOM PERROTTA | R. KIKUO JOHNSON

**I'VE HAD UNUSUAL** luck with adaptations of my novels. With *Election*, I handed my manuscript over to director Alexander Payne and he made this amazing movie—true to the book but with a heightened satiric sensibility. I really loved the film that Todd Field made of *Little Children*; it's darker than my novel, but it's erotically charged, morally provocative, and packs a real dramatic punch. Still, turning a novel into a film can be limiting—forcing a big, complex story into a small box. And watching all the great TV over the past 10 years, I started to think, wouldn't it be fantastic to have a bigger box? *The Leftovers* was my first opportunity to venture into long-form television, and I was lucky enough to have Damon Lindelof, co-creator of *Lost*, as a partner.

*The Leftovers* is a book that grew out of another book. While doing research for my novel *The Abstinence Teacher*, I kept bumping into the evangelical Christian concept of the Rapture. I'm not a religious person, and I found myself thinking about the Rapture not as a theological concept but as a powerful metaphor for getting older, for living with loss and mystery. That idea turned into *The Leftovers*, where 2 percent of the world's population has just disappeared without any explanation. There's no scientific or religious narrative that can make sense of the event; it just seems random. I wanted to tell an apocalyptic story that didn't involve a nuclear holocaust or a zombie invasion. *The Leftovers* takes place in a world that looks exactly like the world we live in now. It's not about how we survive when there's no food and no clean water, but how we endure when everything we believed has been, if not obliterated, then seriously challenged.

People have pointed out that there's some similarity to *Lost* in that the characters are dealing with a profoundly mysterious situation. But it's not set on a desert island; it's set in a recognizable suburban town. (Coincidentally, Damon and I grew up about 20 minutes apart in New Jersey.) In some ways, this has put Damon in a very different storytelling universe than *Lost*. But *The Leftovers* will probably provoke some of the same reactions from the audience—the excitement of exploring the mystery through the lives of a broad range of characters and, possibly, some frustration when the show doesn't produce a simple explanation for what happened.



In *The Leftovers*, Justin Theroux plays Kevin Garvey, a father trying to maintain normalcy in the face of chaos.

Damon is a more visceral and intuitive writer than I am, with a real gift for creating suspense and generating surprises. I think he enjoys it when he shocks me with a wild idea, but once he executes it, I end up agreeing with him 90 percent of the time. It's crazy to watch him work; he'll go into a kind of trance and start telling you the movie he's seeing in his head. It's like having my story filtered through an imagination that works on a very different frequency than my own. And often those visions will end up onscreen, almost completely intact. The other 10 percent of the time, I push back and try to talk him out of something or slow him down. And to his credit, he listens. That's the give and take of collaboration. One thing I've learned over the years is that there's a certain amount of surrender involved in this. You have to go into it with openness and enthusiasm, a willingness to reimagine the world you created in the novel.

When Damon and I wrote the first version of the script, HBO said, "We really like it, but we're concerned that the main character is too nice a guy." In the book he's a good man; he's the mayor, trying to keep his family and community together under dire circumstances. Cable TV viewers tend to be drawn to darker, more dangerous, morally ambiguous characters: Tony Soprano, Rust Kohle, Walter White, etc. The transformation of Kevin Garvey (played by Justin Theroux) was part of my collaboration with Damon, but it was also the result of the influence of HBO as another voice in the conversation. Making the character the town's police chief—a more violent and conflicted position—has definitely made the show more electric.

It's exciting to see the story unfold on such a large canvas and to live with the characters over time. We're working on the final episodes of the first season now—we had an idea of where we wanted to go, but we're getting there by a radically different route than we expected. Surprising yourself is one of the true pleasures of storytelling. And yes, we know the ending ... until we decide to change it.

PAUL SCHIRALDI/HBO

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Al Capone vs. Blackbeard

**700** NUMBER OF LIFE-SCIENCES COMPANIES HEADQUARTERED IN SAN DIEGO // **70.5 DEGREES** AVERAGE DAILY TEMPERATURE // **7,000** NUMBER OF FARMS (MORE THAN ANY OTHER U.S. COUNTY) // **700,000** NUMBER OF EXOTIC PLANTS HOUSED AT THE WORLD-FAMOUS SAN DIEGO ZOO (THE 3,700 ANIMALS ARE RAD TOO) // **$158 MILLION** VALUE OF SAN DIEGO'S ANNUAL AVOCADO CROP (IT'S THE NATION'S LEADING PRODUCTION AREA)

# BEER, SCIENCE, TACOS IN THE SUN

## SAN DIEGO IS MORE THAN COMIC-CON

**$163 MILLION** AMOUNT THAT SAN DIEGO COMIC-CON IS EXPECTED TO ADD TO THE LOCAL ECONOMY THIS YEAR

**ALL 130,000 BADGES** for this year's San Diego Comic-Con International—the four-day fan fest that takes over America's Finest City each July—are gone. It sold out in less than 90 minutes. But hey, you could visit San Diego some other weekend this summer. Sure, you probably won't run into the cast of *Agents of S.H.I.E.L.D.* or see advance clips from blockbuster sequels, but you're guaranteed good weather and great Mexican food in the city that invented the triathlon. You'll just have to endure SD's awesome science museums, outdoor activities, more than 70 breweries, and not seeing a single cosplay Greedo.

—ERIC STEUER

### SEE

**Reuben H. Fleet Science Center** This science museum has dozens of fun and educational hands-on exhibits. Catch a space flick in the center's immersive Imax Dome.

**Geisel Library** Rumored to be the inspiration for the snow fortress in *Inception*, this striking structure is where UCSD students come to study. Named for longtime San Diegan Theodor "Dr. Seuss" Geisel, it's home to the world's largest collection of Seuss manuscripts.

**USS *Midway*** One of the longest-serving aircraft carriers in US history was decommissioned in 1992 and is now a floating naval and aerial museum docked at San Diego's Navy Pier.

### DO

**Go on a beer tour** There are 74 breweries in town; hire a company like Brew Hop to take you behind the scenes at Stone, Ballast Point, Karl Strauss, and Mission.

**Hit North County beaches** Tony Hawk recommends this area to avoid the crowds that flock to Pacific Beach and La Jolla.

### EAT

**TACOS!** SD is renowned for its taquerias—there are more than 1,000.

**Donut Bar** Crème brûlée is this shop's mainstay (each one is torched by hand). Pro tip: Order online before they run out.

"Most of the skate parks in San Diego are state-of-the-art, but my favorites are Alga Norte in Carlsbad, Encinitas YMCA, and Alex Road in Oceanside."

—Tony Hawk, skate legend, videogame character, and San Diego native

ILLUSTRATION BY JUSTIN MEZZELL; COMIC-CON: SANDY HUFFAKER/THE NEW YORK TIMES/REDUX; LIBRARY: SHANNON BATES

T X T

THE DETAILS
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AT THE INTERSECTION OF
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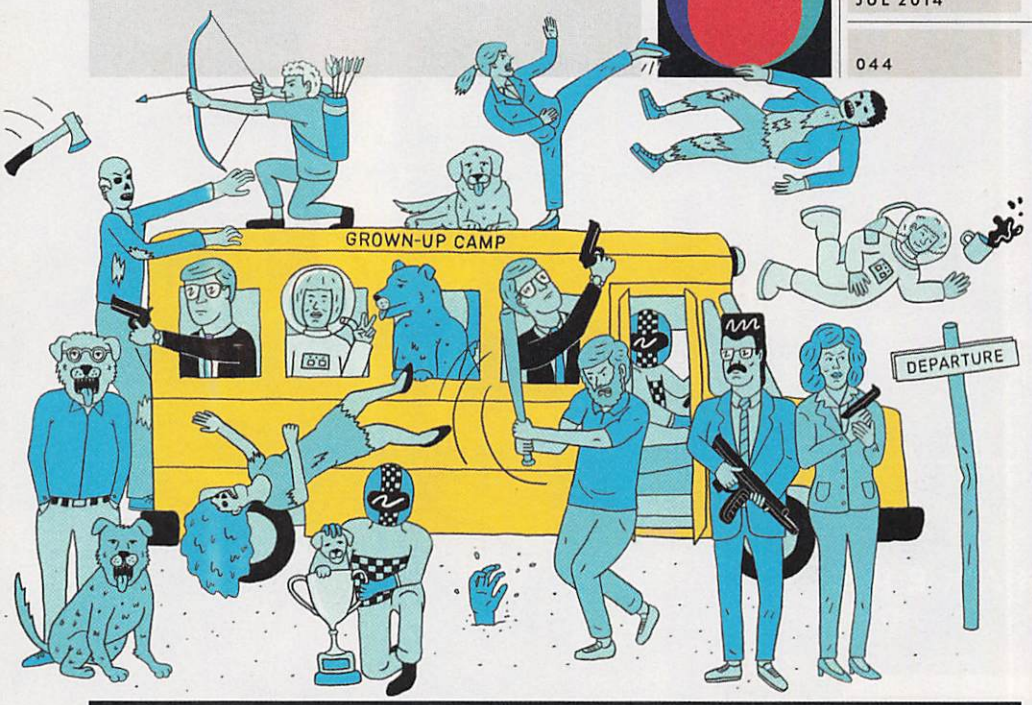



# CONTINUING RECREATION
## 5 CAMPS FOR REALLY BIG KIDS

**WE GET IT:** Growing up sucks. What you gain in responsibility you lose in free time. What you need is camp—for grown-ups. This summer, the recreation industry has you covered, but instead of archery, color wars, or papier-mâché, you can get something more tailored to adult (or at least adultish) sensibilities. Adventure is calling. —JULIA GREENBERG

**Adult Space Academy**
HUNTSVILLE, ALABAMA // $649 FOR FOUR DAYS
Climb aboard a shuttle, build and launch a rocket, and train like an astronaut with micro-gravity and disorientation simulators. Dreamed of piloting a lunar lander? Well, Houston, mission accomplished.

**Zombie Survival Camp**
WHITING, NEW JERSEY // $450 FOR A WEEKEND
The zombie apocalypse is unlikely, but that doesn't mean you shouldn't prepare anyway. On a 60-acre field in South Jersey, learn to shoot a crossbow, throw axes and knives, hunt small game, build a shelter, and lead a team of survivors to safety.

**Camp Unleashed**
BERKSHIRES, MASSACHUSETTS // $799 FOR FOUR DAYS
Leave your laptop behind for this getaway for people and pups alike. Activities are tailored for canines, including water tricks, dock diving, agility obstacle courses, scent games, and language training (for humans to pick up canine cues, of course).

**Covert Ops Miami**
MIAMI // $3,995 FOR FOUR DAYS
If you're the *Homeland* type, enroll in a camp with lessons on counterterrorism warfare, assault rifle techniques, and krav maga. Pro tip: Don't miss the "military gas training" or "fire a weapon from a moving vehicle" drills. They may not relax you, but hey, you're learning essential spy skills.

**Skip Barber Racing School**
VARIOUS LOCATIONS // UP TO $4,500 FOR THREE DAYS
Have a need for speed? Learn the skills to race on a track, like corrective oversteer, midcorner adjustments, and flip-proof drifting. Plus: Learn to read competition flags. Crazy-fast car included.

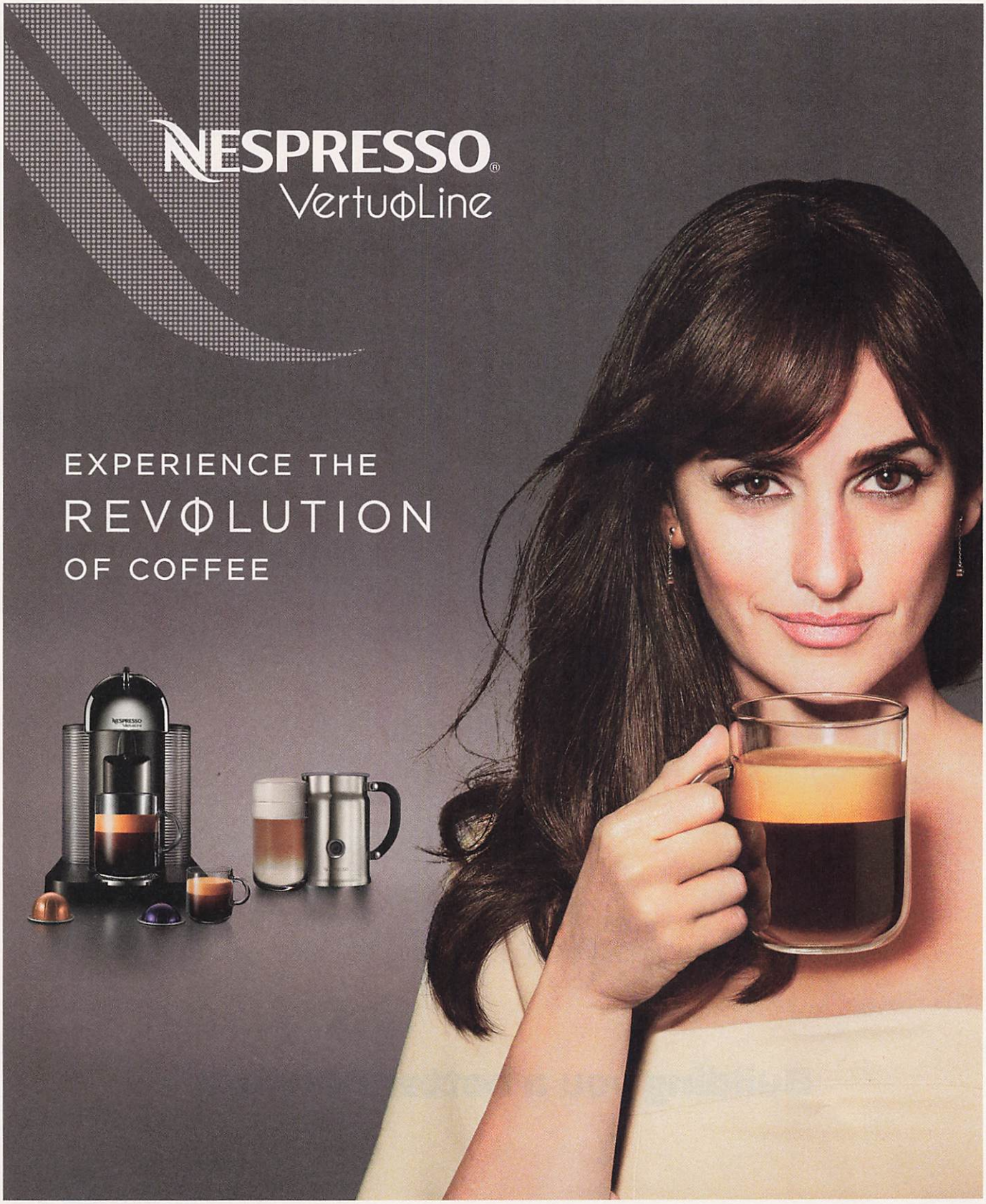
PAUL WINDLE

# WORSHIP MORE GODS!

**THROW ME A ROPE,** I'm drowning in Greek demigods! The new Brett Ratner film, *Hercules*, follows hot on the pecs of January's *Legend of Hercules*, ostensibly upgrading the legend with a healthy dose of Dwayne Johnson. And that's just the beginning of the Hellenic hellstorm. Every time you turn around, another sword-and-sandal-and-CGI extravaganza springs from the head of a studio exec—*Immortals*, *Minotaur*, the *Clash of the Titans* reboot that besmirched Ray Harryhausen's legacy, even oily flexfests like *300: Rise of an Empire*. I'm being force-fed cinematic souvlaki, and I crave variety! If movie moguls want to pillage mythology, they should look beyond the Peloponnese peninsula. Where's the movie about Bobbi-Bobbi, the snake deity of Australia's Binbinga? Or the Hawaiian shark god Ka-moho-ali'i? And why are all the Sumerians relegated to bad-guy roles in *Ghostbusters*? O Gozer the Destroyer, make me a Keymaster and I will force filmmakers to chronicle your deeds during the rectification of the Vuldronaii and the third reconciliation of the last of the Meketrex supplicants! Many assistant directors will know what it is to be roasted in the depths of the Slor that day, I can tell you!

For more Angry Nerd, go to VIDEO.WIRED.COM.

ILLUSTRATION BY ZOHAR LAZAR

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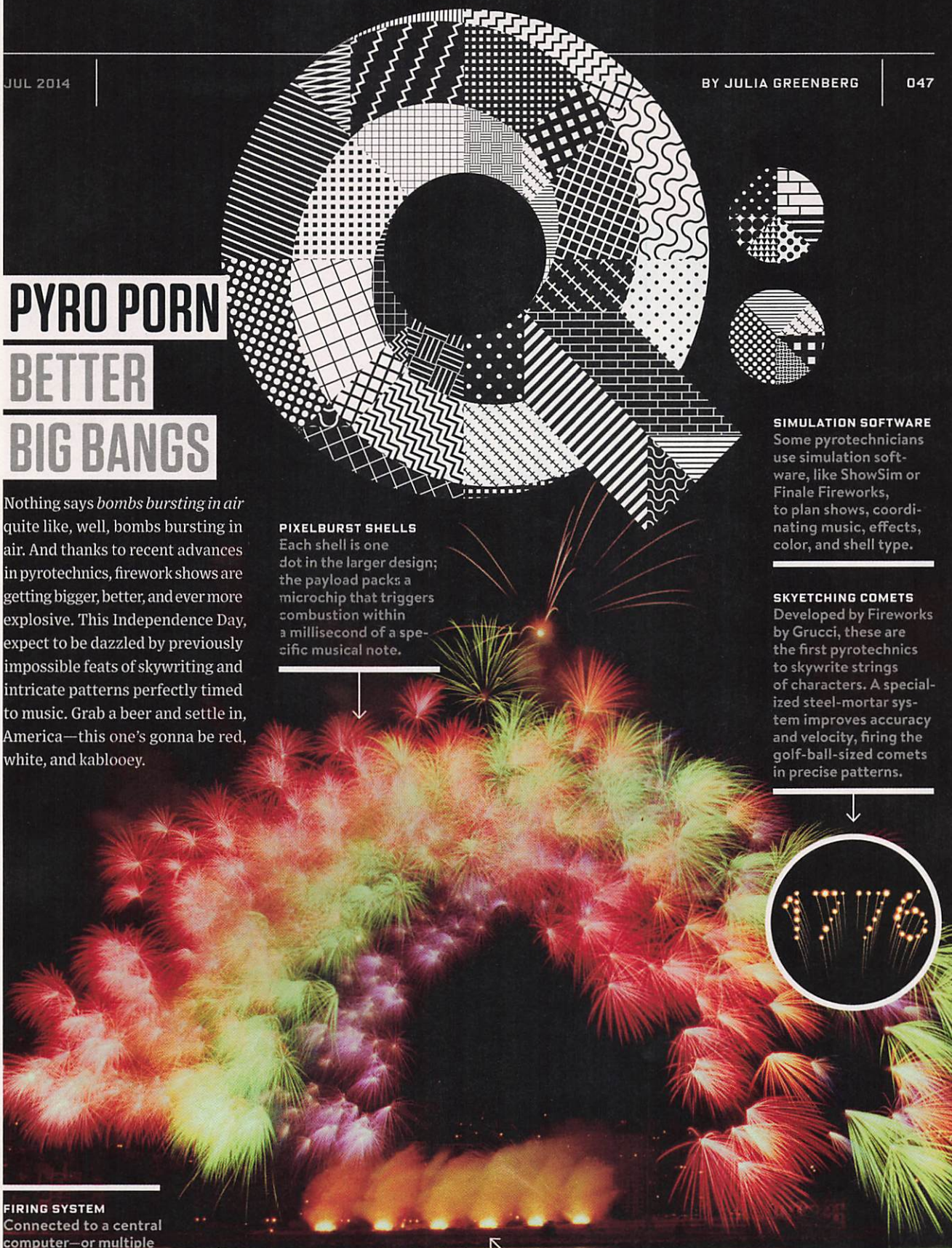
# PYRO PORN

## BETTER BIG BANGS

Nothing says *bombs bursting in air* quite like, well, bombs bursting in air. And thanks to recent advances in pyrotechnics, firework shows are getting bigger, better, and ever more explosive. This Independence Day, expect to be dazzled by previously impossible feats of skywriting and intricate patterns perfectly timed to music. Grab a beer and settle in, America—this one's gonna be red, white, and kablooey.



**PIXELBURST SHELLS** Each shell is one dot in the larger design; the payload packs a microchip that triggers combustion within a millisecond of a specific musical note.

**SIMULATION SOFTWARE** Some pyrotechnicians use simulation software, like ShowSim or Finale Fireworks, to plan shows, coordinating music, effects, color, and shell type.

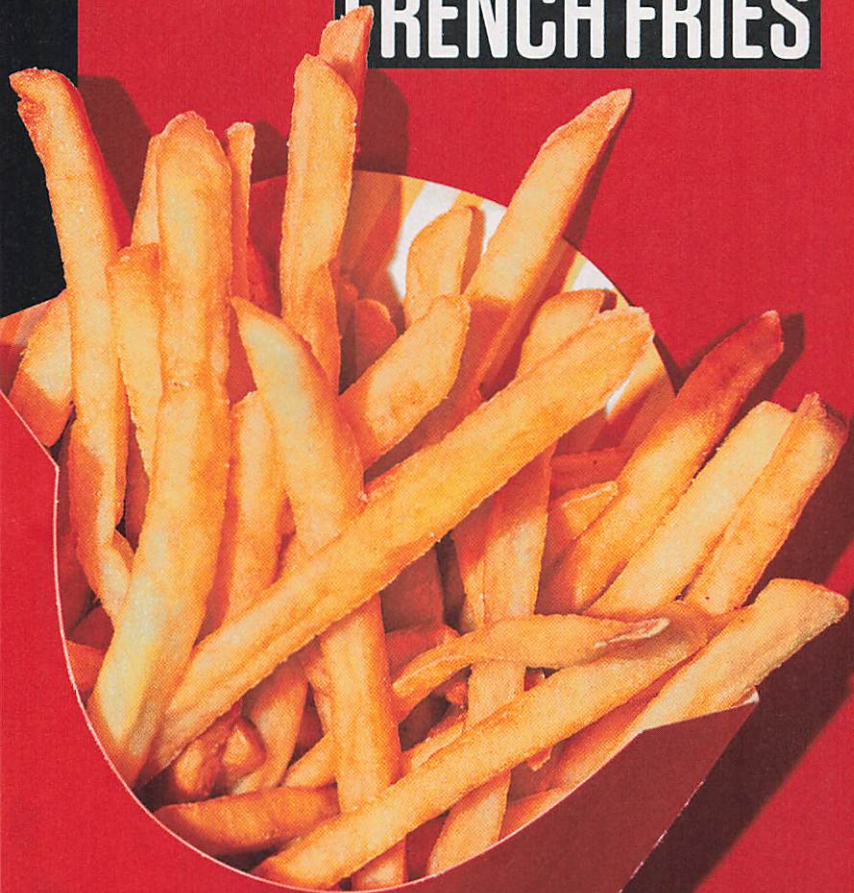
**SKYETCHING COMETS** Developed by Fireworks by Grucci, these are the first pyrotechnics to skywrite strings of characters. A specialized steel-mortar system improves accuracy and velocity, firing the golf-ball-sized comets in precise patterns.

**FIRING SYSTEM** Connected to a central computer—or multiple computers for huge displays—this is the brain of the show, coordinating mortar firing via multiconductor cables.

**MORTARS** The cannon-like components that shoot shells or comets are tailored for specific fireworks. For Pixelbursts, Grucci uses high-density fiberglass tubes. A snug fit enables max control.

BY RICHARD NIESSEN; INSET BY BRYAN CHRISTIE DESIGN; PHOTO COURTESY OF FIREWORKS BY GRUCCI

# WHAT'S INSIDE McDONALD'S FRENCH FRIES



## POTATOES

Mickey D's uses varieties like the Russet Burbank, which have a nice oval shape and just the right balance of starch and sugar. Excess sugar can cause a fry to have brown spots where it's overcaramelized, leaving a burnt taste and deviating from the uniform yellow-arches color. Just in case, the spuds are blanched after slicing, removing surplus sugar.

## DEXTROSE

A brief dip in a corn-based sugar solution replaces just enough of the natural sweet stuff that was removed by blanching. The result is a homogeneous outer layer that caramelizes evenly. You'll add more sugar later when you squirt on the ketchup.

## SODIUM ACID PYROPHOSPHATE

Taters can turn a nasty hue even after they're fried—iron in the spud reacts with the potato's phenolic compounds, discoloring the tissue. The phosphate ions in SAPP trap the iron ions, stalling the reaction and keeping the potatoes nice and white throughout the process.

## VEGETABLE OIL

In the good old days, McDonald's fries were cooked in beef tallow. But customer demand for less saturated fat prompted a switch to vegetable oil in the early '90s. Here, that means oils of varying saturations combined into something reminiscent of beef tallow. There's canola (about 8 percent saturated fat), soybean oil (16 percent), and hydrogenated soybean oil (94 percent). And to replace the essence of beef tallow? "Natural beef flavor," which contains hydrolyzed wheat and milk proteins that could be a source of meaty-tasting amino acids.

## MORE VEGETABLE OIL

That's right, the fries get two batches of vegetable oil—one for par-frying at the factory and another for the frying bath on location. The second one adds corn oil and an additive called TBHQ, or tert-butylhydroquinone, which at high doses can cause nasty side effects in rats (mmmm ... stomach tumors). McDonald's uses this oil for all its frying, so the stuff usually sits around in big vats, which means it can go rancid as oxygen plucks hydrogens from lipids. TBHQ acts as an antioxidant, replacing those pilfered hydrogens with its own supply.

## SALT

Sprinkled on just after frying, the crystals are a uniform diameter—just big enough to get absorbed quickly by crackling-hot oil. Now add ketchup and you've achieved the hedonistic trifecta: fat, salt, and sugar.

# MAGNETIC RIDE CONTROL. NOW YOU CAN BUY THAT HOUSE ON THAT COBBLESTONE STREET.

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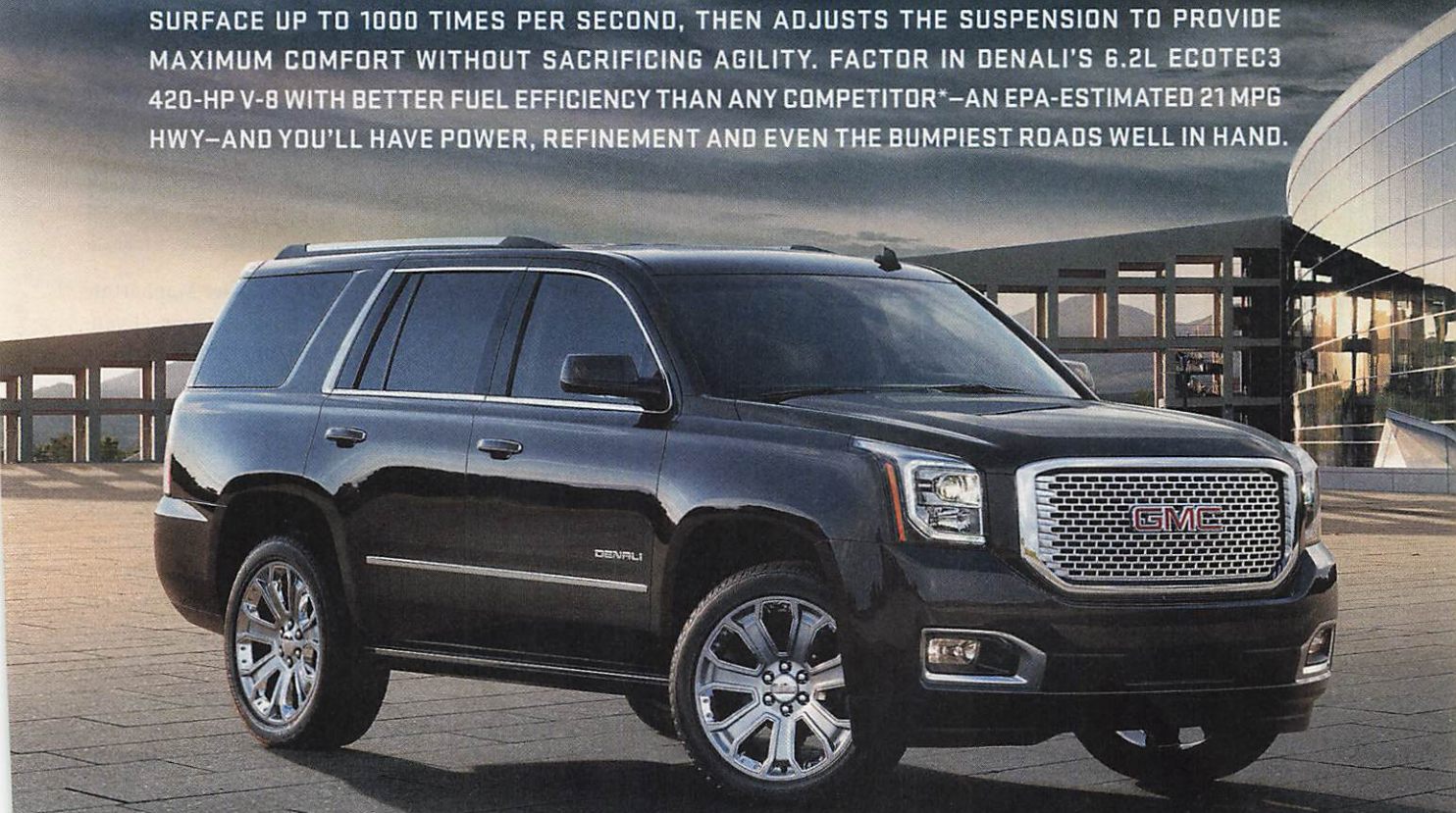


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# LIGHT RAIL HELPING THE NYC SUBWAY SHINE

**WHEN THE NEW FULTON CENTER** transit hub opened in Lower Manhattan in late June, it connected nine subway lines and four stations. (Eventually it'll also link to New Jersey's PATH system.) And thanks to some brilliant design work, the $1.4 billion project also connected parts of the deep, dark system to natural daylight for the first time. ¶ The light enters through a 53-foot skylight. Then it encounters something called the Sky Reflector-Net, a gigantic meshlike structure sheathed in hundreds of aluminum reflectors that bounce the light into the transit center and even down to the mezzanine level, four stories underground. Artist James Carpenter, whose design firm collaborated on the project, says it's a little like outdoor Greek theater or art-deco-era theaters with the sky painted on the ceiling: "It's a way of recapturing that idea using materials technology and optics." ¶ New York isn't the only city getting its shine on; subterranean structures worldwide, from Denver's Union Station to the Städel Museum in Frankfurt, Germany, are deploying architectural flair to inject a glorious dose of vitamin D into our fluorescent-lit existence. "Daylight is very much about humanizing an environment," says Vincent Chang, a partner at Grimshaw Architects, which also worked on the Reflector-Net. The New York subway can certainly use the help.

DATASTREAM // **BEST-SELLING DOUGHNUTS AT DUNKIN' DONUTS (U.S.), IN ORDER**

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CHOCOLATE GLAZED CAKE

CHOCOLATE FROSTED

BOSTON KREME

JELLY-FILLED

REFLECTOR-NET (2014) © JAMES CARPENTER DESIGN ASSOCIATES, GRIMSHAW ARCHITECTS, AND ARUP. FULTON CENTER.

IF WE
touch the screen,
can we feel the cat?
Technology that simulates touch –
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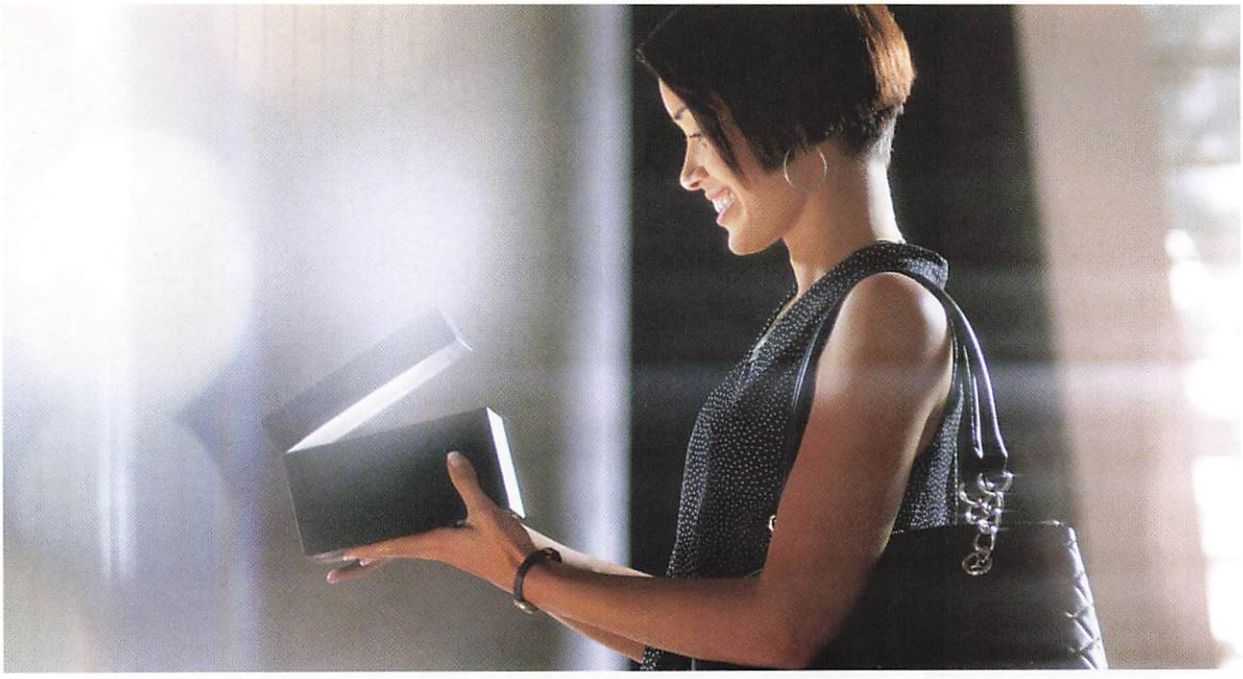

# INNOVATION IN THE AGE OF EXPERIENCE

We live in an age where businesses need to look beyond the aesthetics of a product or the practicalities of a service...where consumer engagement and loyalty count far more than features and benefits alone...where consumers expect to interact with or even influence suppliers – not just be sold to.

Products are no longer enough for today's consumers who value experience over all else.

*THE AGE OF EXPERIENCE HAS ARRIVED*

Executives and academics everywhere accept that in the modern economy, the key to success is delivering consumer experiences that demonstrate true differentiation.

And yet, the task is a daunting one at best. What exactly is meant by experience? And, more importantly, how can a business influence it, given the complex array of emotional, rational and physical responses that inevitably drive consumer connection?

*IF WE CHANGE THE WAY WE INNOVATE, CAN WE DEVELOP EXPERIENCES THAT CONSUMERS DEMAND?*

The key to making consumer experience the true focus of innovation is to capture insights and expertise from across a business's entire ecosystem.

Shaping the right consumer experience requires not only the involvement of but also the collaboration between all roles within a company – from marketing and management to sales and engineering.

Only by connecting all the dots between people, ideas and data can a business drive consumer loyalty, engagement and value.

*IF WE WANT TO THRIVE IN THE AGE OF EXPERIENCE, WHERE CAN WE TURN?*

The **3D**EXPERIENCE® platform from Dassault Systèmes is a business experience platform: a new class of collaborative environment specifically designed to help companies create differentiating consumer experiences.

It enables everyone within a company to play an active role in experience development.

With a single, easy-to-use, compass-like interface, the **3D**EXPERIENCE platform powers INDUSTRY SOLUTION EXPERIENCES – based on 3D design, analysis, simulation and intelligence software in a collaborative, interactive environment.

The Age of Experience represents a significant opportunity for businesses prepared to place a new focus on creating unique and truly rewarding consumer experiences.

It's time to ask the right questions, understand the present and navigate the future – now made possible with the **3D**EXPERIENCE platform.

Discover the **3D**EXPERIENCE platform and our INDUSTRY SOLUTION EXPERIENCES at **3DS.COM**.

**The 3DEXPERIENCE Platform Explained**

**The 3DEXPERIENCE platform is a business experience platform. It provides software solutions for every organization in your company – from engineering to marketing to sales – that help you, in your value creation process, to create differentiating consumer experiences.**

**With a single, easy-to-use interface, it powers INDUSTRY SOLUTION EXPERIENCES, based on 3D design, analysis, simulation and intelligence software in a collaborative interactive environment. It is available on premise and in public or private cloud.**

3DEXPERIENCE

**It takes a special kind of compass to understand the present and navigate the future.**

***About Dassault Systèmes*** Dassault Systèmes, the **3D**EXPERIENCE Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced and supported. Dassault Systèmes' collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. The group brings value to over 190,000 customers of all sizes, in all industries, in more than 140 countries.

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RYAN BERKLEY | BY JULIA GREENBERG



# UNDER THE SEA
# FREAKY FISH, WEIRD WORMS

We know more about the surface of Mars than the deep seas, and despite new tech plunging humans and submersibles ever deeper, two-thirds of marine species remain a mystery. Recent books—*Deep* by James Nestor and *The Extreme Life of the Sea* by Stephen R. Palumbi and Anthony R. Palumbi—explore the denizens of this liquid underworld and the gear we've used to find them.

**EPIPELAGIC ZONE**
The top sliver of the sea hosts most of its known life. Light supports photosynthesis, so algae and phytoplankton—and the fish that eat them (and the fish that eat those fish)—flourish.

**MESOPELAGIC ZONE**
Little light reaches the twilight zone, so animals with bulging eyes and bioluminescence thrive, using the dim light to hide, large eyes to see, and their own light to confuse predators or lure prey.

**BATHYPELAGIC ZONE**
In the midnight zone, bioluminescent and transparent species with gelatinous skin (like glass squid) feed mostly on other animals or detritus drifting down from the waters above.

**ABYSSOPELAGIC ZONE**
Three-quarters of the ocean floor lies in these near-freezing waters. Limited oxygen and crushing pressure mean few fish. Traits like hermaphroditism and sexual dimorphism are common: Flexible mating habits boost survival.

**HADALPELAGIC ZONE**
Hydrothermal vents are literal hotbeds for chemosynthetic life. Some biologists think individual vents evolved unique life-forms—the vast distances between them limit interaction among the species.

0–660 FT
660–3,300 FT
3,300–13,100 FT
13,100–19,700 FT
19,700–35,797 FT

MUDSKIPPER
SHINGLE URCHIN
TUNA
VIPERFISH
FIREFLY SQUID
LANTERNFISH

**2,297 feet:** A camera with a lure mimicking a bioluminescent jellyfish in distress captured the first video of a giant squid.

STOPLIGHT LOOSEJAW
DUMBO OCTOPUS
SPANISH DANCER SEA SLUG
HUMPBACK ANGLERFISH
DEEP-SEA GLASS SQUID
BLACK SWALLOWER

**13,124 feet:** Remote-operated underwater vehicles, like Hercules, capture deep-sea samples, sounds, and topography.

SEA PIG
SEA SPIDER
TRIPOD FISH
POMPEII WORM
XENOPHYOPHORE
BETHNIC COMB JELLYFISH
DEEP-SEA AMPHIPOD
VENT SHRIMP

**35,787 feet:** Director James Cameron returned from the Mariana Trench with previously unknown microbial mats, sea cucumbers, and squid worms.

PHOTOGRAPHY BY MANFRED CLINTJENS (SPANISH DANCER). DEEPSEAPHOTOGRAPHY.COM (DEEP-SEA GLASS SQUID)

# SPACE CHASE
# HOW TO CATCH A COMET

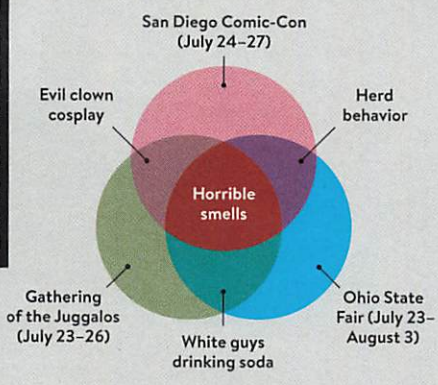
**AFTER A 4.3 BILLION-MILE** nonstop flight, Rosetta is about to reach its destination. The European Space Agency vehicle has spent a decade circling our solar system in pursuit of comet 67P/Churyumov-Gerasimenko. And to prepare for the trip, ESA tested and equipped the vessel for any cosmic curveballs it might encounter on the way.

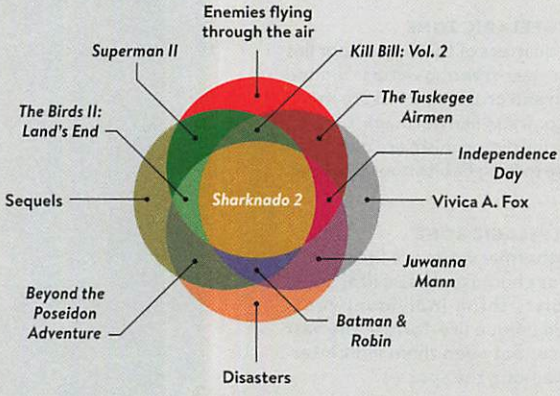
Consider the temperature, for example. The area where Rosetta and 67P will rendezvous, out beyond the asteroid belt, receives only 4 percent as much sunlight as we get here on Earth—it's frigid and dark. So before launch, engineers exposed the ship to conditions near -300 degrees Fahrenheit. They also invented new solar technology—called low-intensity, low-temperature cells—to help the sun-powered craft utilize every last photon.

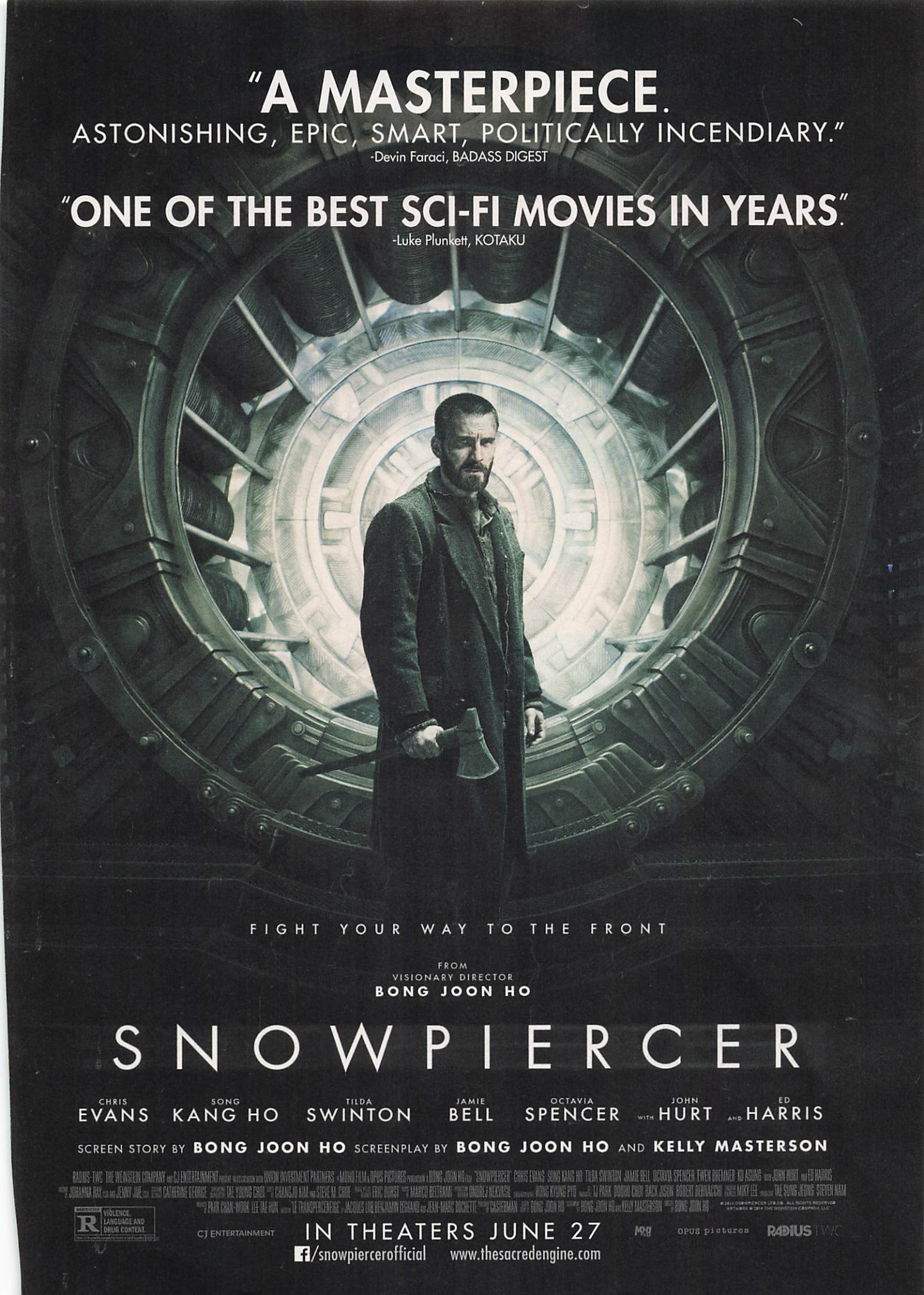
Even then, saving power was a top priority. For many of those billions of miles, Rosetta hibernated in what mission planners dubbed "rotisserie mode," spinning around its main axis to maintain its stability and course.

And while cosmic dust particles are tiny, colliding with a cloud of them can spell disaster. Engineers prepared for the worst, wrapping Rosetta in thermal foil shielding and tucking away fuel lines safely in the interior. Now the easy part: landing a smaller onboard probe on a speeding ice-and-rock comet for the first time ever.

## CHARTGEIST


San Diego Comic-Con (July 24–27)
Evil clown cosplay
Herd behavior
Horrible smells
Gathering of the Juggalos (July 23–26)
Ohio State Fair (July 23–August 3)
White guys drinking soda




"A MASTERPIECE.
ASTONISHING, EPIC, SMART, POLITICALLY INCENDIARY."
-Devin Faraci, BADASS DIGEST
"ONE OF THE BEST SCI-FI MOVIES IN YEARS."
-Luke Plunkett, KOTAKU
FIGHT YOUR WAY TO THE FRONT
FROM
VISIONARY DIRECTOR
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SNOWPIERCER
CHRIS EVANS SONG KANG HO TILDA SWINTON JAMIE BELL OCTAVIA SPENCER WITH JOHN HURT AND ED HARRIS
SCREEN STORY BY BONG JOON HO SCREENPLAY BY BONG JOON HO AND KELLY MASTERSON
RADIUS-TWC THE WEINSTEIN COMPANY AND CJ ENTERTAINMENT PRESENT IN ASSOCIATION WITH UNION INVESTMENT PARTNERS A MOHO FILM & OPUS PICTURES PRODUCTION A BONG JOON HO FILM "SNOWPIERCER" CHRIS EVANS SONG KANG HO TILDA SWINTON JAMIE BELL OCTAVIA SPENCER EWEN BREMNER KO ASUNG WITH JOHN HURT AND ED HARRIS
PRODUCED BY JOHANNA RAY CO-PRODUCED BY JENNY JUE CO-PRODUCED BY CATHERINE GEORGE DIRECTOR OF PHOTOGRAPHY TAE YOUNG CHOI DIRECTOR OF PHOTOGRAPHY CHANGJU KIM AND STEVE M. CHOE MUSIC BY ERIC DURST DIRECTOR OF PHOTOGRAPHY MARCO BELTRAMI PRODUCTION DESIGNER ONOREJ NEKVASIL EXECUTIVE PRODUCER HONG KYUNG PYO PRODUCED BY TJ PARK DOUHO CHOI BACK JISUN ROBERT BERNACCHI PRODUCED BY MIKY LEE PRODUCED BY TAE SUNG JEONG STEVEN NAM
PRODUCED BY PARK CHAN-WOOK LEE TAE HUN DIRECTED BY "LE TRANSPERCENERGE" BY JACQUES LOB, BENJAMIN LEGRAND AND JEAN-MARC DOCHETTE PRODUCED BY CASTERMAN DIRECTED BY BONG JOON HO PRODUCED BY BONG JOON HO AND KELLY MASTERSON DIRECTED BY BONG JOON HO
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# MR. KNOW-IT-ALL

# SEATBACKS & SEX SCENES

**I worry on airplanes that the person in front of me will wrench their seat back and damage my laptop. Don't we all have a responsibility to look behind us first?**

**THE SHORT ANSWER** is yes. Here's the long answer: In 1998, a 6′3″ man named Ira Goldman was flying from Minneapolis to Amsterdam and, aghast at the fundamental injustice that the person seated ahead of him could unilaterally occupy the space he needed for his sizable legs just by reclining, he rigged his umbrella across his foldout table in a way that blocked that seat from tilting backward. By 2003, Goldman was marketing a product: Knee Defender—two little clips that do the same dirty work.

The existence of the Knee Defender—specifically, the product's to-hell-with-you ethos—has drawn a lot of vitriol. Some people think it's too harsh and combative and that to actually deploy a Knee Defender against another human being you'd have to be an arrogant bully, a Mussolini of the skies. One person was so disgusted that he wrote an email to Goldman: "I should come put a bullet in your head." And yet Goldman also gets emails from people who initially felt the Knee Defender was a vile invention but now are buying one—and it's often because they had their laptop screen cracked by a thoughtless recliner. It left them no choice.

Goldman understands the criticism. But don't blame the user of the Knee Defender, he says, blame the airlines: As his website puts it, "If airlines will not protect people from being battered, crunched, and immobilized ... then people need options to protect themselves." He's heard all the counterarguments and counter-counterarguments and play-acted them for me. ("*Just don't use your laptop, this isn't your dick-fucking office. Do your work before you get on the plane or buy a business-class seat.* Well, my company won't pay for business class, and I have a presentation when I land.") There's just no getting around the fact that when we board a plane we are thrown into a brutal, zero-sum game. Not everyone's going to be comfortable, and one person's comfort comes at the expense of another's. So Goldman feels that knee-defending is a legitimate tactic. Righteous, even, since an unruly onboard arms race of knee-defending might actually pressure the powers that be to change. I asked Goldman if this every-man-for-himself approach implies that a person reclining shouldn't feel any responsibility to look back first. "Exactly," he said.

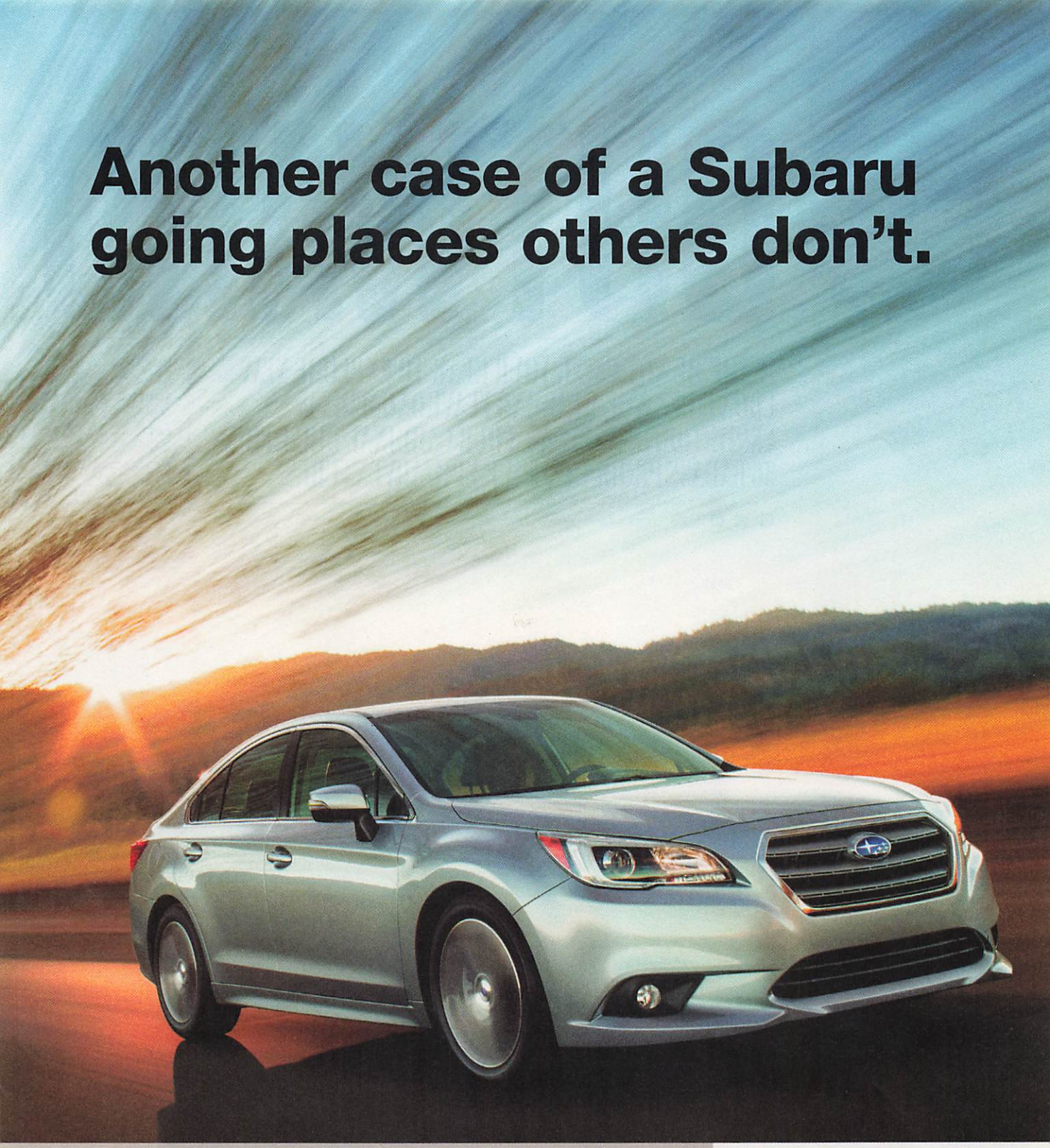
Well, I disagree. I don't want to live in a world where it's acceptable for us to turn on each other. What if the abuse we're dealt by the airlines had the opposite effect—if it fostered solidarity with fellow passengers, an impulse to be kinder? What if we were a compassionate community of living bodies, hurtling through the sky together at 600 miles an hour?

I know it's rough in that cabin. I'm no Pollyanna. I've fought my share of subtle yet merciless elbow turf wars over middle armrests. But I'm not proud of that. Just turn around. Look at your fellow passenger. *Then* recline. It's easy to forget we are leaning on each other.

**Why, exactly, couldn't siblings John and Joan Cusack do a sex scene? Straight actors do gay scenes; friends play lovers.**

Dude. It just wouldn't work. You know that. W

# Another case of a Subaru going places others don't.



The all-new 2015 Legacy® doesn't follow. With industry-leading safety, it features available EyeSight® driver assist technology.* Combine that with the confidence of Symmetrical All-Wheel Drive at 36 mpg† and the most spacious interior in its class,** and you'll find yourself feeling something very new. **Love. It's what makes a Subaru, a Subaru.**

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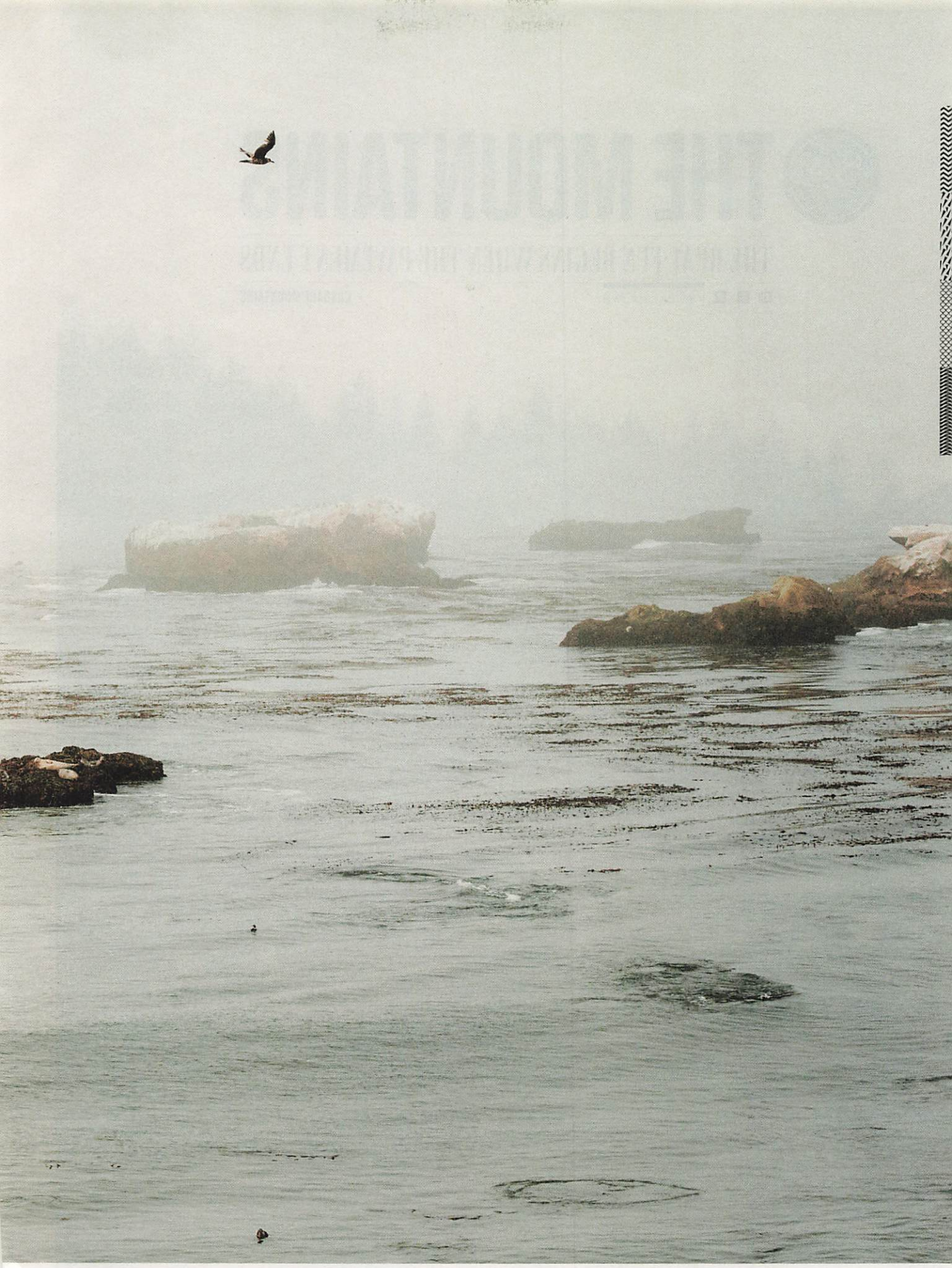
# OUTWARD

**IF YOU'RE NOT USING YOUR GEAR TO EXPLORE NEW FRONTIERS, YOU'RE DOING IT WRONG. THIS IS EXPEDITION GADGET LAB: FOUR CARDINAL DIRECTIONS, 36 BADASS PRODUCTS, FOUR EPIC ADVENTURES.**


NORTH ..... P. 60
Cascade Mountains
SOUTH ..... P. 66
Mojave Desert
EAST ..... P. 70
Big South Fork
WEST ..... P. 76
California Coast


058 | JAKE STANGEL



North RIDE

# THE MOUNTAINS

## THE REAL FUN BEGINS WHEN THE PAVEMENT ENDS

060 | BY JOE BROWN | CASCADE MOUNTAINS

**THIS IS A DISASTER.** Just a few hours into a three-day motorcycle ride through the unpaved wilds of Washington's Cascade Mountains, I've already dropped the bike several times. I'm beat up; my hair is matted with sweat. My wool

→

BADGES BY ALEX ROKA

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base layers are wet-stuck to my skin. My confidence is brittle as burnt paper.

On a motorcycle, confidence is a small target that you need to hit squarely. Get too cocky, overcook a turn, and you're a flower-covered cross on the side of a highway. But if you ride timid, your *lack* of speed could put you at risk of wiping out; the faster the wheels are turning under you, the more gyroscopic stability they provide.

I'm doing that second thing: crawling too slowly over a rutted and rock-pocked moonscape. I'm supposed to be testing my own ability to step away from the civilized world, trying out the best equipment for eating, sleeping, and riding under the unobstructed sky. Instead, I'm spending way too much time looking up at the sky from underneath nearly 500 pounds of Kawasaki.

The problem, I'm guessing, is that I've strapped about 50 pounds of clothes and camping gear to the back of the bike, about a mile above my center of gravity. I'm riding the 2014 edition of the KLR650, a venerable model dating back to 1987. The KLR is the french fry of motorcycles: You can find one (and someone to fix it) anywhere from California to the Central African Republic. Its terrain-eating suspension and centrally mounted engine are designed to deliver the balance and clearance you need to go miles beyond the end of your comfort zone.

**WHAT I PACKED**

- 2014 Kawasaki KLR Special Edition $6,599
- AGV AX-8 Dual Evo helmet $400
- SW Motech Enduro LT tank bag $125
- Dryspec D38 Rigid dry bag $140
- Redverz Gear Series II Expedition tent $450
- Big Agnes Spike Lake 14 sleeping bag $200
- Icebreaker base layers $190
- Black Diamond Voyager lantern $40
- Rev'it Sands 2 jacket and pants $820
- Alpinestars Toucan boots $450
- Alpinestars Archer gloves $230

For full product reviews, go to WIRED.com/expedition.

## THE ROAD GETS BAD, BUT IN THE BEST WAY—MUDDY, NARROW, RUTS YOU COULD USE AS A KOI POND.

Unfortunately, the KLR's seat is 35 inches off the ground; my jeans have a 30-inch inseam. I don't so much sit on the bike as perch atop it like the kid in *The NeverEnding Story* riding the luck dragon. Only, the KLR doesn't kneel down gently to let me off. It just kind of tips over.

The first time I dumped the bike, it pinned my leg to the ground; if not for a pair of armored Alpinestars boots, my trip probably would have ended right there with a broken foot. It's not like I'm some first-timer. I started riding in college and have experience everywhere from the race track to rush hour. But I don't have much history off-road; riding on dirt is completely different from pavement. And because the bike is so tall, I can't get my feet on the ground to stop it if it starts tipping. This thought is in my head as the KLR slips out from under me again around a corner atop a steep slope of grass-covered rock. The only thing stopping me from stuffing a grenade under the bike and walking to the nearest bar is my lack of a grenade.

But if the problem is my center of gravity, I can do something about it. Choosing to think of it as an improvisation instead of a defeat, I unload the bags, set up a base camp, and saddle up again to explore the vicinity.

**FREE OF ITS LOAD,** the KLR is still a beast, but I can handle it better. Now, if the bike starts to shift, I can recover from the wobble. Riding has begun to look feasible, but I'm still making mistakes. I'm shattered from the morning's dose of catastrophe, and I just want the day to be over. I point the KLR toward the campsite.

My tent, in contrast to the bike, is cooperative. Also it has a garage. Made by a mom-and-pop shop called Redverz, it sleeps two (technically three, but don't even) and has a ride-in vestibule to keep your

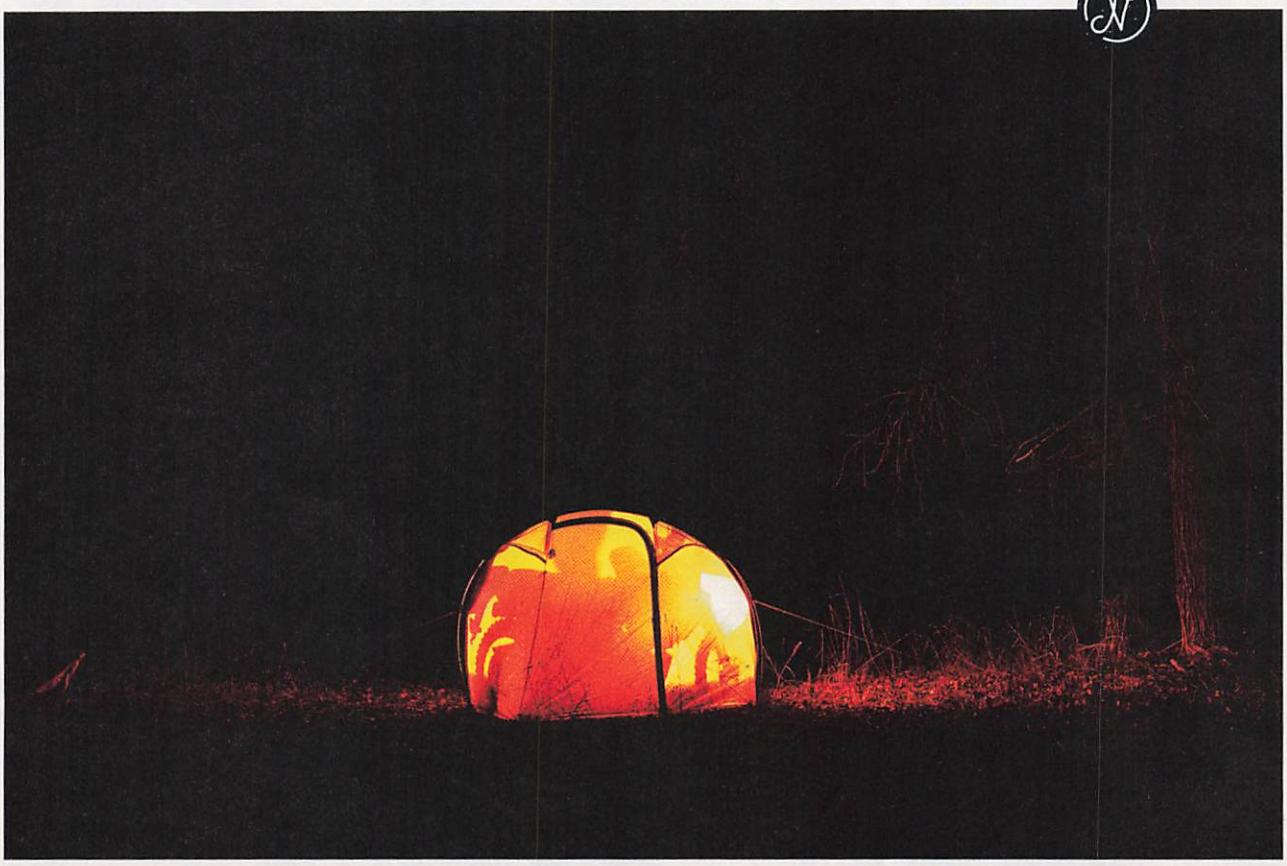
CIGARETTES

©2014 R.J. REYNOLDS TOBACCO CO.

# CAMEL

## TASTE IT ALL

SURGEON GENERAL'S WARNING: Smoking Causes Lung Cancer, Heart Disease, Emphysema, And May Complicate Pregnancy.



bike sheltered from the elements. Sometimes, like when you're ducking a sandstorm while riding in the Paris-Dakar Rally, shelter for your gear as well as yourself can be important. On a clear weekend in the Washington mountains it is, I'll admit, a little overkillish.

The tent is great, but its instructions are laughable. One of the steps is basically "Put the poles in their corresponding sleeves," but the single laminated page gives no indication of what corresponds to what. (I realize later that there is some half-assed color coding at play.) The tent also comes with stakes, so I put them in the ground, even though the instruction sheet doesn't mention them. Half an hour later I've got shelter. I wheel the bike in, start a fire (outside), change into sweatpants, rock back in my camp chair, and open a beer.

The Redverz Expedition tent is so motorcycle-centric that it has a built-in garage to shelter your bike and gear.

**THE COLD OF THE** morning on my nose—about the only thing peeking out of my down mummy bag—wakes me. It's still dark out, so I flick on my little Black Diamond LED lamp and dress without leaving the bag. (Put the next day's clothes in your sleeping bag at night and they're warm when you get up in the morning.)

Between my wool base layers and the insulated Rev'it riding getup, I'm cozy. Leaving my gear at the campsite, I get an early start and ride up a logging road that's supposed to have some challenging terrain. It gets bad, in the best way: muddy, barely 6 feet wide, ruts so deep you could use one as a koi pond.

I ride it a few times, forcing myself to be light on the bars, to let the front tire follow the terrain, to steer with my knees rather than my arms. Speeding up, I aim for a sharp crest I previously avoided. I roll on the throttle to transfer weight to the rear wheel and hit hard. I clear it, only to realize that there's a bigger rock on the other side. Gravity and momentum pitching in, I hit that one even faster, and I feel the bike leave the ground. I touch down, tip to the right, throw my weight left, ride it out, and then skid my rear tire to a stop. This is what you call a turning point.

By the third morning, the bike feels dialed in. The air is cold on the patch of neck my suit and helmet leave exposed. I ride paved roads from mountain to mountain, and the bike is happy on the blacktop: dancing through the tar-snakes on the farm-lined back roads. Off-road, headed up a rock-and-mud slope, I push maybe a little too hard and almost lose it a few times. Almost.

ILLUSTRATIONS BY BROWN BIRD DESIGN

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# THE DESERT

## RIDE HARD AND LEAVE FEAR IN THE DUST

066 | BY STEPHANIE PEARSON | MOJAVE

**THE PLAN WAS** austere and elegant. I would ride a mountain bike pulling a trailer on a 77-mile loop around the Mojave National Preserve at the height of spring. Wildflowers would blanket my route, and the three-day expedition would merge

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two loves—riding and camping—into my first bike-packing epic.

Then reality intruded. A week before my departure, a Mojave park ranger told me that my proposed route was nuts. "A very physically fit rider could do it, but I'm concerned about the trailer you'll be pulling," she wrote in an email. "The rough route may cause the trailer to destabilize your bike, and there will be no water or facilities of any kind—nor will cell phones work."

I soon found that it didn't matter which route I took. Thanks to broken pipes and a broke government, there were only three guaranteed water stops in the entire 2,398-square-mile preserve, and two of those were within 10 miles of each other.

I took a break from panicking and strategizing to pick up a few smaller items—including a key-chain vial of pepper spray. I figured I might need it for a rogue coyote. The Outdoorsman, the only shop in my hometown that seems to sell it, has bars on the door and shiny handguns lined up under a glass counter like glazed doughnuts. "Are you trying to ward off four-legged or two-legged predators?" asked Blain, the clerk with a ZZ Top beard. "If it's two-legged, you might consider a .44 Magnum. Then again," he laughed, "if you've never shot a gun, you'd probably have better luck with the pepper spray."

As I walked out with my powder-pink cylinder of oleoresin capsicum, Blain called cheerily after me, "May you never have to use it!"

His words freaked me out. I hadn't considered the potential for dangerous humans. In lieu of guns, I would have state-of-the-art gear to protect me. I'd be carrying a DeLorme inReach satellite communicator with a big red SOS button and generous battery power, and I had already programmed it so a few key friends could follow my ride online. I didn't set it up for all of my Twitter friends to see. What if one of my followers is a Charles Manson copycat who lives on a ranch in the Mojave?

Other essentials I was bringing: 30 spare bike parts and tools recommended by an expert bike-packer friend, a minimalist tarp shelter, a superlight sleeping bag, a 5.5-gallon water container, high-powered lights, a camera, and food. All of this had to fit on a Bob Ibex Plus trailer or in a 20-liter Osprey hydration pack with a pocket for everything. When I loaded the trailer for a test ride, I looked like something out of *The Beverly Hillbillies*. And that was before I bungeed on the water jug.

At least my bike, the Yeti 575, was hard to beat. With 5.75 inches of springy play on the front shock, the aluminum bike has been around for about 10 years and is a cult classic, renowned for its cushy downhill ride. For 2014, Yeti increased the wheel size from 26 to 27.5 inches and retuned the rear shock to create more support as the spring in the front fork compresses.

It was giving me grief, however: Without refitting the 575 with a special rear axle, you can't properly attach a trailer. I'd ordered the custom axle but had forgotten that this new and improved 575 also had larger wheels and thus required a trailer with a larger fork. OK, no trailer. Which meant no way to carry extra water. Now I was wigging out.

**WHAT I PACKED**

- Yeti 575 mountain bike $3,800
- Osprey Synchro 20 hydration pack $130
- DeLorme inReach SE Extreme communication kit $400
- Panasonic Lumix TS5 rugged camera $250
- Specialized Andorra clothing $60–$135
- Sea to Summit Spark Spl sleeping bag $300
- Giro Xara helmet $130
- Smith Optics Pivlock glasses $200
- Light & Motion Stella 500 lamp $200

For full product reviews, go to WIRED.com/expedition.

**I WAS IN A SAGEBRUSH AND JOSHUA TREE HEAVEN, WRAPPED IN SILENCE AND LIT BY STARS.**

But what ever goes according to plan? Five minutes later I had a plan B: Wing it. Instead of following the loop route, I would set up a base at Hole in the Wall, a campsite with water. Then I'd study the map and pedal from there to whatever destinations looked interesting, returning to the familiarity and comfort of my tent each night.

I set out in my car the next morning. Six hundred fifty miles later, when I turned north off I-40 into the Mojave Preserve, my cell phone bars disappeared and the radio got fuzzy. This is it, I thought. I may never see another whizzing semi again. But then I spotted an old desert tortoise on the two-lane road. They can survive for a year without water, so I took this as an auspicious sign. I hopped out of the car and crept toward it to say hello. But I didn't get close enough to frighten it and cause it to pee through its entire full-year water supply—surprisingly, one way these tortoises can die.

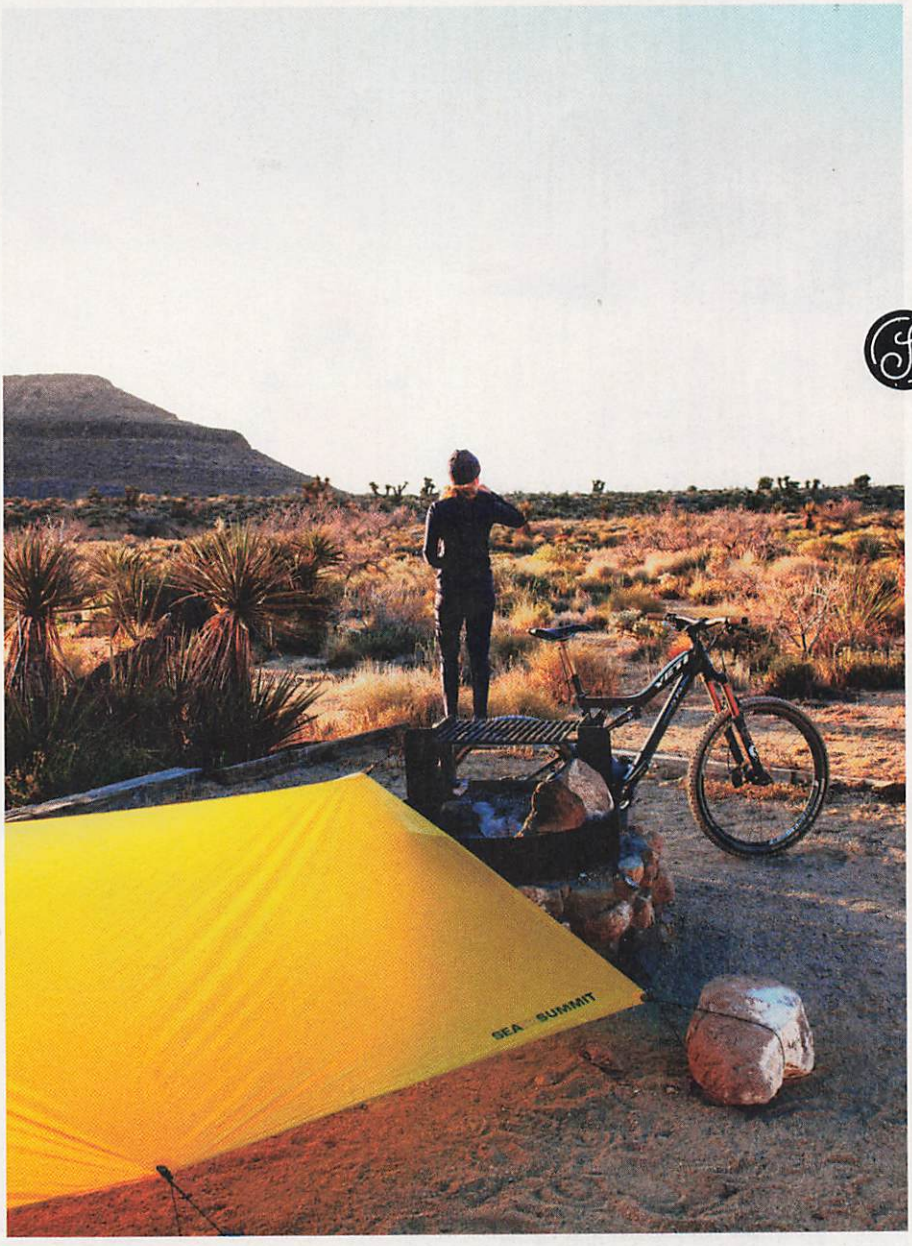
The sun was sinking behind the ridge when I arrived at Hole in the Wall, set at 4,400 feet against volcanic rock cliffs with shiny black whorls that look like melting faces. As I set up my shelter, I bent over a Mojave yucca and stabbed myself in the forehead. Dabbing the blood away, I sat on a rock and breathed in the peaceful scene. I was in a sagebrush and Joshua tree heaven, wrapped in silence and lit by stars.

Dawn was bright and cool. I rode 15 miles up and down washboard roads, past leafless trees and giant boulders that looked karate-chopped by Zeus. As I rode, I groped for the Osprey hydro-pack's bladder nozzle magnetically secured to my chest strap and steadily sipped from it as if on an oral-drip IV.

By 12:30 the temperature was a balmy 80 degrees, but the sun was so intense that it felt much hotter. Seeking shade, I returned to camp and hid under my tarp. I listened to flies buzz and tried to read but soon realized that the only way through this inferno was to lie perfectly still and will the breeze to waft my way.

At around 4 pm I set out again, this time behind Hole in the Wall, up gently sloping Wild Horse Canyon Road. By 6 the wind had died down. The shadows were long, the light was magic. The climb past mesas and fields of fragrant sage was unyielding, but I locked out the front shock, adjusted my seat post via a handlebar lever, and rode in comfort. With no destination in mind, I turned around at sunset at the top of a rise, unlocked the front shock, and let the bike fly. I pedaled as fast as I could back to camp, relishing the 575's perfect symmetry and the beautiful freedom of life with no baggage.

The Yeti 575 is a versatile full-suspension ride ideal for exploring unknown terrain.

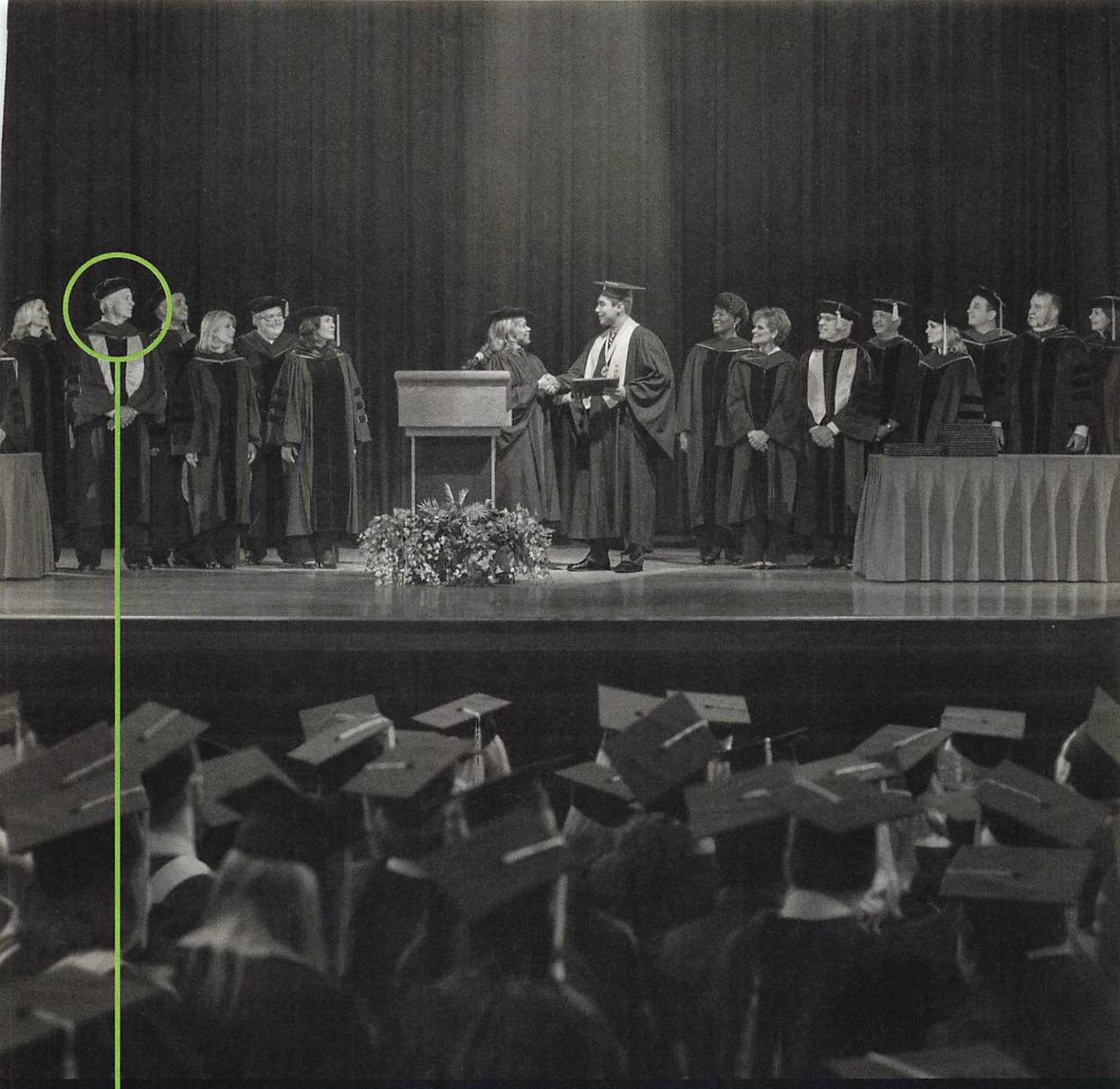


# THE RIVER

## TURNING BACK IS NOT AN OPTION

070 | BY KIRK DEETER | BIG SOUTH FORK

**GETTING THERE** isn't the hard part. One way or another, I'm pretty sure I'm going to wash up at the appointed takeout spot in a few days. It's *how* I get there that has my mind spinning like foam bubbles in an eddy. ¶ I've never paddled



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the Big South Fork of the Cumberland River, which starts in Tennessee and flows northward into Kentucky. I'm told it's beautifully volatile, unblemished by dams yet constricted by sandstone cliffs, with water that can rise and surge on a whim. The rapids, the waves, the seams, the currents: They are all mysteries to me.

Tucked in a ziplock bag in my pocket is a map that highlights the waters most likely to put me in mortal danger. These are Class IV rapids—boat eaters with undercut rocks and deadfall that can suck you down and pin you. I'll have to portage around the big drops. Class II-plus water is plenty for an open-top canoe like the one I'm paddling.

I didn't pack drinking water; I'll have to filter my own. My food supply could fit in a Snoopy lunch pail: two granola bars, two bags of rice, and a bottle of hot sauce. I have ice in a Yeti cooler for any fish I catch.

It's raining as I shove off. Not hard, but enough to make me worry—I don't know how high this river will rise. The first test is just around the bend. I can't see it, but I hear it. It starts like a whisper, a subtle contrast to the whirring frogs on the riverbank. Then it crescendoes to a roar, and as I make the turn, I'm staring straight down a gauntlet of whitecaps and boulders.

There's no turning back.

**ON ANY PADDLING TRIP** you should expect to get wet. Whether you get doused by a downpour, sprayed as you point through the waves, or flipped, a good soaking is the norm. It's how you manage wetness that separates the contenders from the pretenders in the backcountry.

Most important is to keep your core body temperature consistent throughout the day. Get too hot and performance and concentration plummet; get too cold and you lose mental acuity and make dumb decisions. I'm relying on two key items:

**WHAT I PACKED**

- Scott Radian fly rod $795
- Bluesmiths Kanaha long-sleeve shirt $90
- Grayl water filtration cup $70
- LED Lenser H7R.2 headlamp $93
- Keen Class VI water shoes $90
- Marmot Eclipse 3P tent $439
- Cabela's XPG rain jacket $130
- Smith Optics ChromaPop Chief glasses $210
- Yeti Tundra 45 cooler $350

For full product reviews, go to WIRED.com/expedition.

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a hydrophobic but breathable Bluesmiths Kanaha shirt and a lightweight Cabela's XPG rain jacket. Spray beads right off the shirt, and if the clouds really open, I have the other layer tucked under my seat.

I wear quick-dry fishing pants and Keen Class VI river sandals. My camping gear is packed in dry bags, which are lashed to the boat.

I borrowed a two-man whitewater canoe from Sheltowee Trace Outfitters, a local shop that knows this river. Because I'm soloing, I've turned it backward and paddle from what would normally be the front seat to distribute the weight and maintain a stable center of gravity.

Plunging through the first rapid, I whisper to myself, "Keep it pointed straight." The first haystacks lift the bow, and it doesn't dig under the next wave. So far so good. I push the paddle for stability, and the boat tracks and turns smartly, staying in line with the wave train. Only when I look back to admire my feat, inadvertently letting it turn a bit, do I feel a sharp wobble that jolts my confidence.

I needed that reality check. Scanning through surface glare with polarized sunglasses for submerged boulders and other obstacles, I pick my way downriver uneventfully.

**I PITCH CAMP** on the trail that skirts the aptly named Devil's Jump. Then I grab my fly rod and march below the rapid to catch dinner.

I'm the editor of *Trout* magazine; fishing is what I do for a living. But there's a difference between sportfishing and subsistence fishing. Simply put: no catch, no eat.

My rod is a Scott Radian 5-weight, a high-end model with a sublime combination of casting power and finesse feel. I need both on this trip. For starters, I flick a chartreuse Clouser minnow fly across the current and twitch it by stripping in the fly line. I hook a fish, but it's only a tiny smallmouth bass. I'm hungry, but I can't bring myself to kill it. I switch flies five times but catch only another couple of hand-sized smallies before the sun retreats over the canyon wall. I let them go too.

**IN THE MORNING** I portage all the gear around the Devil's Jump rapid. I'm glad I'm traveling light—my three-person Marmot tent, for example, weighs only 5 pounds.

The bear-proof Yeti Tundra cooler's 3-inch foam insulation keeps ice frozen seemingly forever.

The rapids dissipate and I paddle downstream toward the takeout. Before I set camp again, I hike up a cool-running feeder creek, where I've heard there might be trout. I cast a small dry fly into a seam, and a trout rises to inhale the bug. I land it: a nice 10-inch rainbow.

Tonight, dinner isn't just rice.

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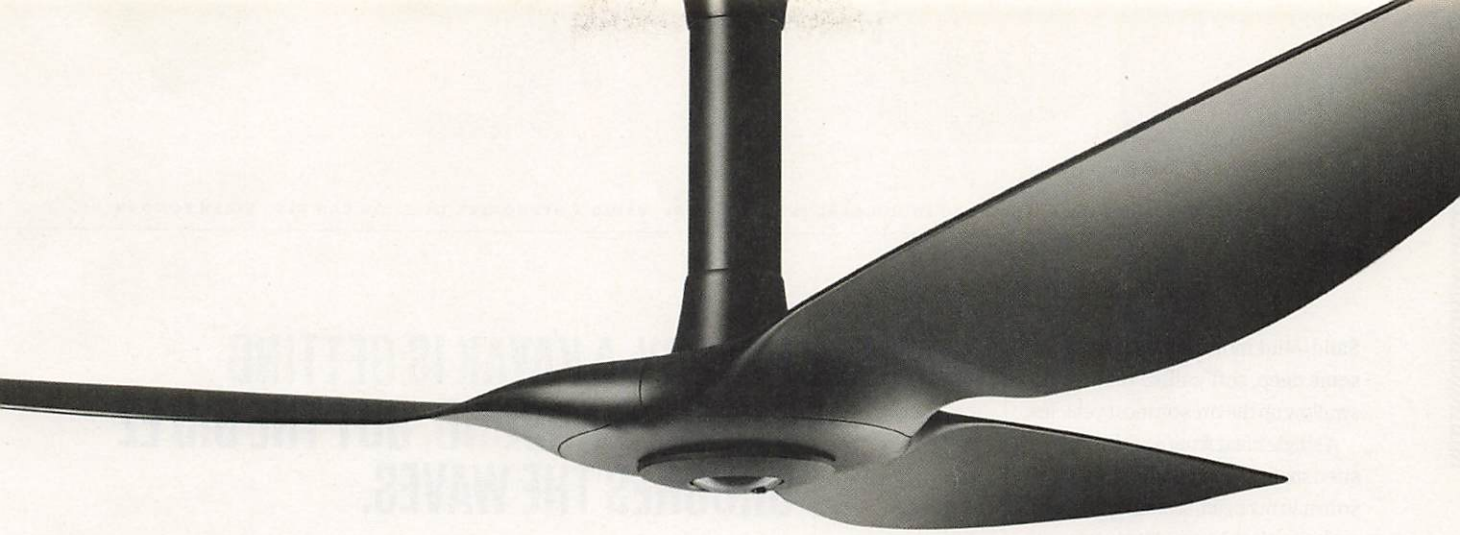
# THE OCEAN

## COME ON A STAND-UP SURFING SAFARI

075 | BY CLAIRE MARTIN | CALIFORNIA COAST

**I'M AT THE EDGE** of the Pacific Ocean for a multiday stand-up paddleboarding trip. Getting to drive my rented Jeep right on the beach is just a bonus. To my left, waves peel in from the Pacific, lapping against the tires. I switch on the special



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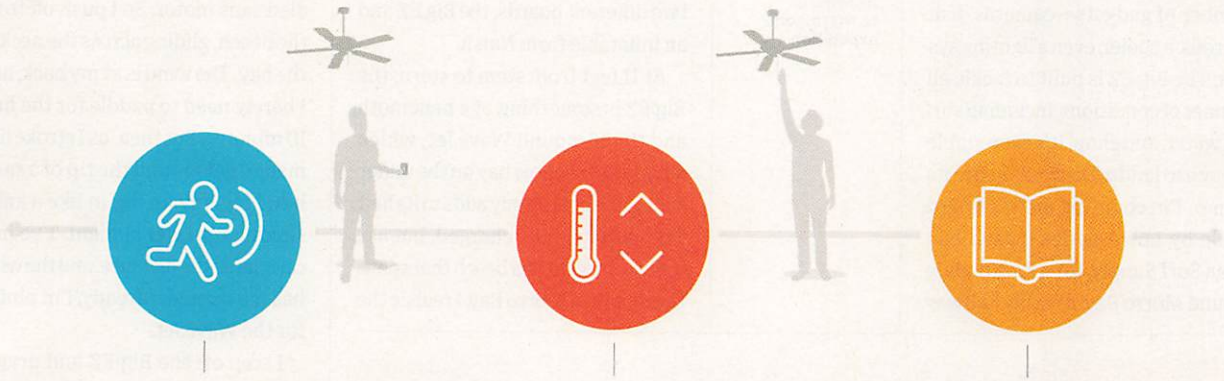

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Sand/Mud mode and venture into some deep, soft gullies that would swallow up the tires on most vehicles.

A single bleat from a park ranger's siren snaps me back into reality. I was so lost in my head, scanning the sand and sea, that I completely missed him—and the sign warning me I was straying into a no-driving zone. Sorry, officer. I flip the car around. Once out of sight, I punch it, arcing over a berm at a speed the ranger would definitely disapprove of.

After some fun on the sand, I start thinking about getting onto the water. Strapped to my roof rack is the Big EZ Angler, a versatile paddleboard that can be outfitted with a number of gadgets—cameras, fishing rods, a cooler, even a lighting system. The Big EZ is built to tackle all manner of conditions, including surf, flat water, and chop. It's even stable enough to land a fish from (hence its name). I'm counting on this board, made by Los Angeles–based Pau Hana Surf Supply, for a long paddle around Morro Bay, roughly halfway between LA and San Francisco. It will be windy, and the board is equipped with an electric WaveJet motor—an add-on that gives it the ability to power through waves or inclement conditions. A little help seems sane rather than lazy, given this journey will involve multiple paddling trips each day—out-and-back excursions from separate starting points using two different boards, the Big EZ and an inflatable from Naish.

At 11 feet from stem to stern, the Big EZ is something of a behemoth, and the 16-pound WaveJet, which slips into a shallow bay on the underside of the board, only adds to its heft. The motor is fully charged, but as I unload my gear at a beach that spans the mouth of Morro Bay, I realize the wrist-mounted controller with the ignition switch is sitting on my living room floor. Two hundred miles away. I'm kicking myself—there's no other way to start the motor. One of the things you sacrifice with a high tech board is simplicity. Looks like I'm going out motorless. Luckily, Pau Hana's founder, Todd Caranto, had assured me the Big EZ can be paddled sans motor. So I push off from the beach, gliding across the neck of the bay. The wind is at my back, and I barely need to paddle for the first 10 minutes. But then, as I stroke like mad to get around the tip of a sandbar, I feel my fin dig in like a knife sinking into wet cement. I've miscalculated the distance, and the wind has me pinned. Already, I'm pining for the WaveJet.

I step off the Big EZ and drag it through the water to a protected inlet, pausing to readjust the camera stand I've brought with me. Most stand-up paddleboards aren't conducive to accessorizing—or even carrying necessities like car keys—but this one is outfitted with a system of anchor points that allow you to screw various attachments into threaded inserts in the deck. Next to my left foot, I install a 3-inch stand with four arms that reach around the waterproof camera, hugging it in place. I flip on the Video setting, aiming the lens at the sandbar to capture the scenery.

Harnessing the wind again, I paddle on but soon find myself in the center of the bay, blown off course. I kneel down, adjust the length of my paddle to improve my leverage, and really push. Within a few minutes,

**WHAT I PACKED**

- Pau Hana Big EZ Angler board $1,350
- Naish Mana Air inflatable board $1,460
- Kailoa LauLau adjustable paddle $300
- Yakima SUPPup Rack $160
- Patagonia R1 back-zip full wet suit $350
- BioLite camp stove and grill $190
- OluKai Kulapa Kai sandals $60

For full product reviews, go to WIRED.com/expedition.

## NEARBY, A KAYAK IS GETTING SLOSHED AROUND, BUT THE BIG EZ CRUSHES THE WAVES.

I'm hugging the edge of the dunes, heading toward the mouth of an estuary where a series of channels flare out into a marsh. The tide is falling, and in less than two hours the estuary will empty out like a drained swimming pool. As I peer beyond the board's beefy nose to check the depth of the water in the middle of the bay, I notice a stingray flapping its ruddy-brown fins through the turquoise water. I take off after it. But at 3 feet wide and 5 inches thick, the Big EZ doesn't exactly turn on a dime. I stab my paddle in pursuit, but within seconds the ray is gone. And when I look back at the board, so is my camera, knocked from its cradle by all the splashing and jostling during the chase.

The tide is changing quickly, so I don't have time to mourn the loss. The takeout I'm aiming for is a dock near the mouth of the estuary. Whitecaps have begun to ripple the water's surface and the wind blows fiercely. Nearby, a kayak is getting sloshed around, but the Big EZ crushes the waves. Feeling cocky, I commit a tactical error: I overshoot the takeout and paddle to a beach at the mouth of the estuary to check its water level (impressively low). To return, I must head directly into the wind, paddling almost in place and fighting the tide for a full five minutes. Finally, after throwing my entire weight into three or four Herculean strokes, I get the board moving and cruise to shore.

BioLite's camp stove contains a thermoelectric generator that can charge your mobile phone.

An hour later, I push the board back out, casting my fishing line into now-placid water. As the sun slips behind the sandbar across the bay, the wind dies down. By this point, my brain is frayed and a chill is sweeping over the water. I reel in my line and surf back to camp empty-handed, knowing I can fall back on the halibut I bought at the docks earlier.

My camp stove, made by BioLite, is a revelation. It burns wood instead of liquid fuel, and a thermoelectric generator inside the stove converts the heat from the fire into electricity—enough to charge a mobile phone. Once I've fed it with some sticks and dried leaves I've gathered, I plug in a USB cord and start juicing my iPhone. I get dinner and a movie in one small package.

Suddenly another park ranger appears. This time, the flames leaping out of the stove have given me away. The ranger peers quizzically at the BioLite, then sees the fish and poblanos sizzling atop the grill I've attached to it. "You're all good," he says, and walks down the beach in the fading light.

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WITH GUEST VOICE OF REASON

JERRY SEINFELD

# THE CODE

A WIRED GUIDE TO BEHAVIOR, MANNERS, AND STYLE ON TWITTER, INSTAGRAM, LYFT, FACEBOOK, TINDER, SECRET, AND EVERYWHERE ELSE

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FOOD INSTAGRAMS EXPLAINED

DAN WINTERS

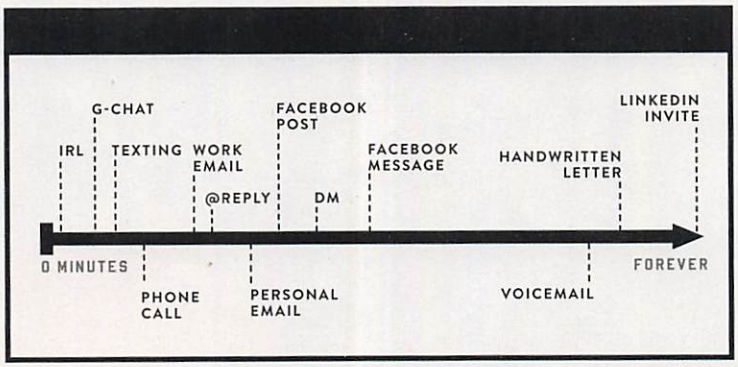
THE ADVICE STARTS HERE



- NEVER LET A MAGAZINE PHOTOGRAPH YOU WEARING GOOGLE GLASS.
- DON'T FOLLOW BRANDS—YOUR FOLLOWERS WILL GET ADS.

# FORGET GOOGLE GLASS—FOR NOW

Before there was Google Glass, there was the DynaTAC. Released by Motorola in 1984, this early handheld mobile phone weighed nearly 2 pounds and cost $3,995. It was for suspendered Gordon Gekko–ish masters of the universe. It was for dicks. ¶ Back then, Motorola predicted that using a cell phone would eventually seems as normal as "checking the time on an electronic watch." They were right, and now our phones are so integrated into our lives that it's almost rude not to have one. ¶ Glass is the DynaTAC of wearable computing. Between the in-group tiered rollout and the $1,500 price point, Glass is an in-your-face marker of social class—a symbol of self-importance that suggests the wearer has too much money and too little fashion sense—and that's caused a backlash. It's been banned from restaurants, a woman was assaulted for wearing Glass inside a San Francisco dive bar, and a group called Stop the Cyborgs is campaigning for Glass-free zones. ¶ So for now, wear Glass only when the technology it will eventually supplant is heavily prevalent. Tech conference where 75 percent of the people are on a laptop or cell phone? Yes. Dive bar? No. (Exception: situations when you can use your Google Glass subversively, like to capture police brutality.) Over time, as Glass gets less elitist, you can loosen up the restrictions. ¶ Once wearables become truly ubiquitous, the etiquette will reverse itself: The things we do with smartphones will seem intrusive, and the passive efficiency of wearable cameras and communication devices will be a mark of politeness. Waving screens around to capture the newlyweds kissing will seem as rude as calling someone when a text would have sufficed. With our hands freed up, gestures will flourish. We'll all become a little Italian, with subtle, elegant sign language for everything. *I'm on a call ... OK to take a pic? ... Sure I want to hook up. Let's run an immunocompatibility check.* ¶ It'll still be a while before you should wear your Glass to a dive bar, though. —JONATHON KEATS




## ASK JERRY

When is it OK to spoil a movie or TV show?

Whenever you want! I don't care that someone missed it; if I want to talk about it, I'm going to talk about it. By the way, Sandra Bullock's fine. She makes it.

UNFOLLOW 10 PEOPLE RIGHT NOW. NOW FOLLOW 10 NEW PEOPLE. YOU'RE WELCOME.

# It's OK to Tinder While Drunk

You're at the bar waiting for your friend to come back from the bathroom, and you've got a decent buzz going. Twitter's boring and Vine is annoying, so you launch Tinder. Then common sense kicks in. "No good can come from this," you think, and tuck your phone away. Not so fast: According to social psychologist Claude Steele, Tinder and intoxication are meant for each other. ¶ That's because they both tap into the same kind of behavior. "When intoxicated, you're making decisions based on a fragment of understanding," says Steele, who published a seminal study on alcohol and social behavior. Most of the time—like smarting off to the giant dude you just spilled a drink on—that approach would be a detriment. But with Tinder, it's a plus: A mere four photos and a tagline, Steele says, forces people to make decisions based on a cursory grasp of the situation. ¶ A sober person might balk at those limitations. Let those worrywarts obsess over their OkCupid profiles! You, on the other hand, should drink up and let your reptile brain do the swiping. —MONICA KIM

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XANAX.....FACEBOOK
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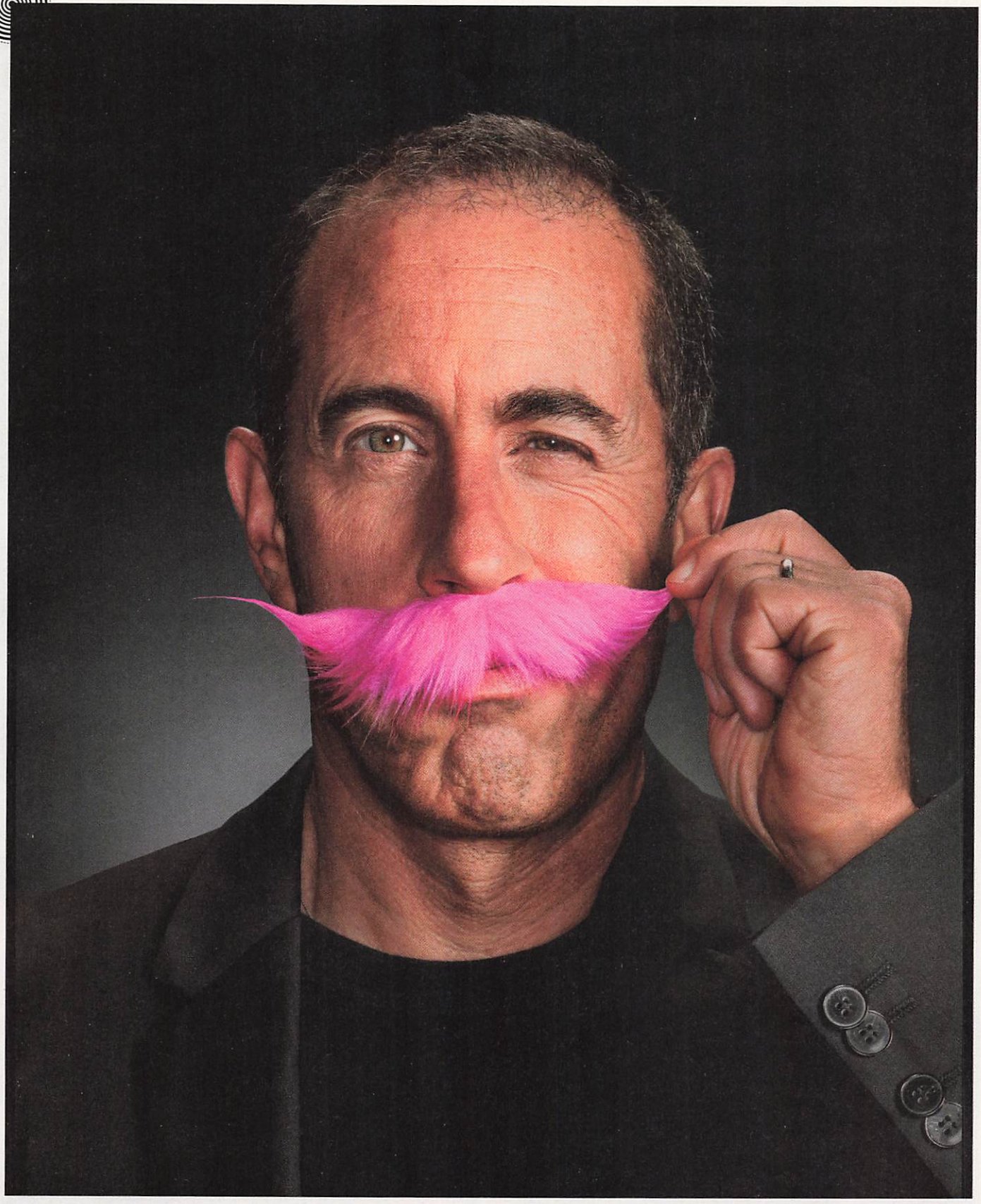


- DON'T ATTACH YOUR CAR'S LYFT MUSTACHE TO YOUR FACE AND OFFER "RIDES."
- DON'T ENDORSE A #LONGREAD YOU HAVEN'T ACTUALLY READ.
- INSTALL WAZE ON YOUR PHONE AND LEAVE IT ON EVEN WHEN YOU DON'T NEED DIRECTIONS.
- DON'T TYPE OVER PEOPLE WHEN YOU'RE COLLABORATING IN A GOOGLE DOC.
- DON'T INDISCRIMINATELY SCRAPE ALL METADATA FROM PHONE CALLS WITHOUT INFORMING CONGRESS.
- MUTE ALL ANNOYING FRIENDS AND RELATIVES ON TWITTER. ALSO HIDE THEM ON FACEBOOK.
- "I LOVE MY HUSBAND" ISN'T A SECRET. "I LOVE *YOUR* HUSBAND" IS A SECRET.
- NO GROUP PHOTOS ON TINDER.

- A HOODIE'S HOOD IS VESTIGIAL—DON'T PUT IT UP.
- IT'S OK TO TAKE BUZZFEED QUIZZES.
- DON'T ANTAGONIZE GOOGLE SELF-DRIVING CARS.
- IT'S NOT OK TO POST YOUR BUZZFEED QUIZ RESULTS ON FACEBOOK.
- DO ANTAGONIZE PEOPLE WEARING GOOGLE GLASS.

## ASK JERRY

If someone posts about a death in their family, is it appropriate to "like" it?

Yes, it is OK to like the post. Because *you* haven't died, and that's something you like. We all like when we haven't died.

## Feel free to brag. Lose the humble.

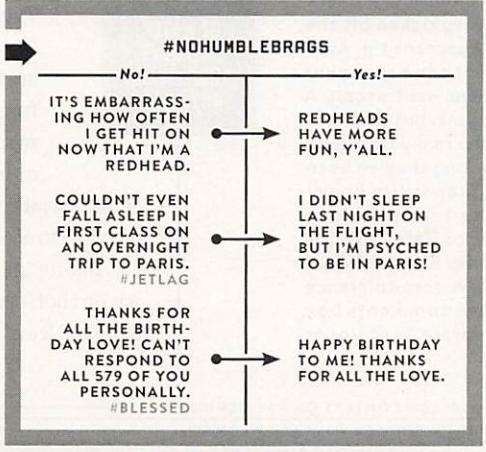
"Can't believe I finished that Ironman in the top 50—it was my personal worst." Nope, that dash of humility doesn't disguise all that self-promotion. Jean Twenge, a psychology professor at San Diego State University, cowrote a book about people like you: ***The Narcissism Epidemic: Living in the Age of Entitlement***. "Bragging alone makes you sound like a narcissist," Twenge says. "Humblebragging makes you sound like a narcissist who is also being deceptive." It's normal to want to share the awesome things that happen. Share the good stuff, but share it sparingly, and remember your audience. Mom and your besties are always going to be excited about your achievements. Former colleagues, acquaintances, and other random followers not so much. So if you have something worth bragging about, just say it outright, Twenge says. "I spill salad dressing on my tie, and guess who I meet an hour later? The president of the United States." Annoying. "I got to meet the president today!" Awesome.

—ELISE CRAIG

## Screw LinkedIn Endorsements

So you've got an impressive résumé and you've duped some power players into connecting with you. You still need to master the finer points of LinkedIn if you want to collect any job offers. We asked Steve Ganz, head recruiter for USPublishingjobs.com, how to avoid common mistakes and land the gig of our dreams.* **PRUNE YOUR NETWORK.** Fewer than 20 is a red flag, but more than 500 can be just as bad from a recruiter's perspective. "I figure they're already connected to anyone they'd want to work with," Ganz says. **ENDORSEMENTS MEAN LITTLE.** They're too easy to give, which drastically reduces their value. After all, people can endorse you without knowing anything about you. **GET A FEW RECOMMENDATIONS.** Testimonials carry some weight, but don't hit up your network unless you want your boss to know you're looking. **DON'T RUSH TO REPORT A LAYOFF.** Lose your job? Hey, you've got more pressing things to do than update your profile. But after two months, Ganz says, it's time to put an end date on your last gig. "After that, you look dishonest." —SARAH FALLON

*NOTE TO BOSS: FOR RESEARCH PURPOSES ONLY!


#NOHUMBLEBRAGS
No!
Yes!
IT'S EMBARRASSING HOW OFTEN I GET HIT ON NOW THAT I'M A REDHEAD.
REDHEADS HAVE MORE FUN, Y'ALL.
COULDN'T EVEN FALL ASLEEP IN FIRST CLASS ON AN OVERNIGHT TRIP TO PARIS. #JETLAG
I DIDN'T SLEEP LAST NIGHT ON THE FLIGHT, BUT I'M PSYCHED TO BE IN PARIS!
THANKS FOR ALL THE BIRTHDAY LOVE! CAN'T RESPOND TO ALL 579 OF YOU PERSONALLY. #BLESSED
HAPPY BIRTHDAY TO ME! THANKS FOR ALL THE LOVE.

## RESPECT THY NEIGHBOR'S HBO GO

We get it: You don't want to spring for cable (or Netflix, Hulu Plus, or Amazon Prime), so you use a friend's account. Totally fine—if the CEO of HBO isn't bothered by HBO Go password-sharing, neither are we. But before you log in to your sister's account for that *Real Sex* binge, remember: Streaming is a privilege, not a right. So heed the rules, mooch. ¶ *Thou shalt return to the main menu before logging out.* No one wants to fire up HBO Go in the middle of a *True Blood* orgy. ¶ *Thou shalt hold the password secret.* Netflix family plans allow for four simultaneous logins, but the account holder gets to decide who gets 'em. (And Hulu Plus allows for just one at a time, so stay the hell off that thing unless your buddy's in jail.) ¶ *Thou shalt keep the recommendation algorithm holy.* Always log in to Netflix as a sub-user, lest the account owner log in to find their home screen dominated by "more shows like *Saved by the Bell.*" ¶ *Thou shalt not log in during season premieres or finales.* Servers have enough trouble coping with demand from legitimate subscribers; don't make it worse. (Hulu Plus and Amazon Instant? Go nuts—*Betas* isn't crashing anyone's server.) —MARK YARM

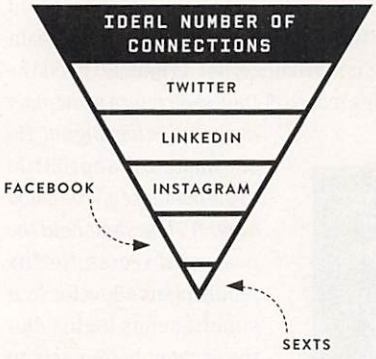
**IF YOU'RE GOING TO CAMP OUT IN A COFFEE SHOP, BRING A POWER STRIP.**



- DON'T TOUCH MY PHONE.
- DON'T WEAR TOE-ARTICULATED SHOES.
- DON'T INSTAGRAM PHOTOS YOU DIDN'T TAKE.

# DROP THAT ONLINE COURSE

If you've enrolled in a massive open online course, you've likely been a model student—for about a week. You're not alone. Up to 95 percent of enrollees don't finish. ¶ But that doesn't mean your slackitude is screwing over the other students. Even if just 5 percent stick with the average Coursera offering, with an enrollment of 40,000 that still leaves 2,000 classmates to interact with. ¶ Timothy Pychyl, author of *Solving the Procrastination Puzzle*, proposes a rule of thumb: Finish two assignments before dropping. You won't waste much time, and "you're more likely to give it a fair shot." After that, you're free to join the millions of dropouts who've come before you. —LEXI PANDELL




THERE IS A TWO-BAD-PUN-PER-MEETING LIMIT. CONTROL YOURSELF.

## ASK JERRY

My best friend is always texting. Is it OK to tell her that it's annoying?

We've entered an age of Annoying Man, where everything that happens is incredibly annoying to somebody else. People are annoying; life is annoying. Don't expect it not to be.

## Be Gentle With Rideshare Ratings

**You wouldn't hesitate to stiff a cabbie who ran up the meter—but that four-buck loss doesn't have much long-term impact. In rideshare services like UberX and Lyft, ratings are forever, and poor marks can get drivers kicked off the road. So make ★★★★★ your default, the equivalent of a 20 percent tip. Average ratings hover around 4.9, so anything less than perfect can haunt your chauffeur. To warrant ★★★★, something minor but significant went wrong. A one-star ding might temporarily deactivate a driver's account, but blacklisting requires a follow-up investigation. At ★★★ and below, you really start hurting a new driver's chance of survival. Consider asking how long they've been driving, then decide if the problem might improve (like subpar city knowledge) or is unlikely to change (rudeness). Go with ★★ for erratic driving or belligerent behavior—then use the apps' feedback boxes to detail exactly what went wrong. And save ★ for the worst trip of your life. Substantiated one-star ratings are grounds for firing, and all these firms have zero-tolerance policies for drugs and alcohol, so leave the evidence in the comments box. (And remember to tuck and roll if you have to bail out midfare.)** –BO MOORE

OFFER YOUR TASKRABBIT A GLASS OF WATER. (OR HAVE YOUR FIVERR GUY DO IT.)

# Unmask Jerks, Even on Secret

The Secret app is a virtual bathroom wall—people can anonymously etch anything from their lamest confidentialities ("I love my new dog more than my old dog!") to their deepest and most shameful ("I gave Ronnie from *Jersey Shore* a handjob in 2007"). In practice, though, it skews heavily toward the "lamest" category. Or at least nondamaging. No one is posting, "Last weekend I murdered someone in an alley behind 7-Eleven," or even "I hate my boss." The open secret about Secret is that it's not for serious secrets. Does that mean it's wrong to call out an anonymous user? ¶ Definitely not. All doxxing rules go back to grade-school rules of conduct. So we turned to the experts: When trusted with their friends' nonthreatening secrets, like "I threw away the sandwich my mom made today," 12-year-old twins Zach and NK remain mum. "Usually I'll keep it to myself or just tell my brother," Zach says. But both boys note that there are times when respecting privacy comes second to doing the right thing: Privacy becomes far less valuable if it's protecting the abuse of innocents. (Case in point: Anonymous doxxes people who pseudonymously post videos of cat torture.) In fact, according to the boys, you should tell someone under those circumstances. "If someone is breaking school rules or doing something illegal, you should tell a person of authority," Zach says. ¶ Slightly more mature scholars agree. Robert Cavalier, a professor of philosophy at Carnegie Mellon who studies ethics and edited *The Impact of the Internet on Our Moral Lives*, says that there are circumstances that may call for a public outing. "When anonymity protects cyberbullying or hate-speech that results in harm," Cavalier says, "those people should be called to account for themselves in public." But for all those banal secrets, take a screen shot, text a friend or your identical twin, and leave it at that. —LAUREN BANS

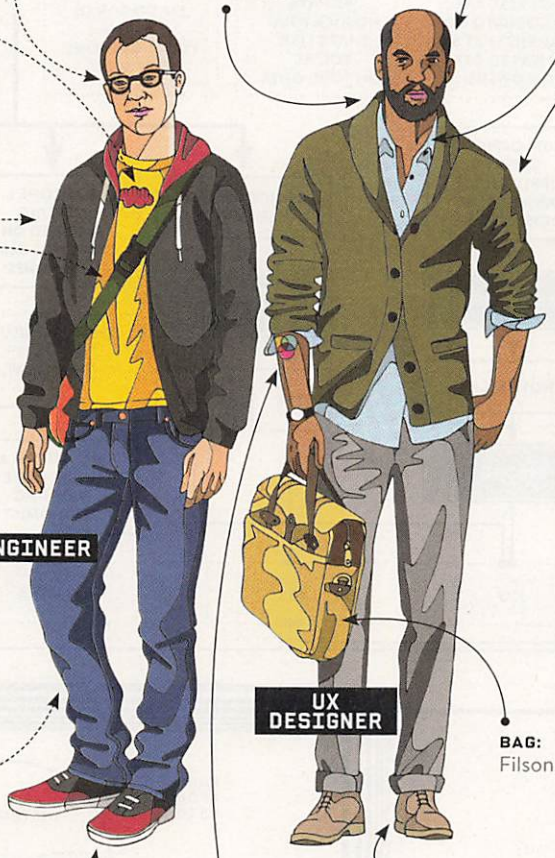


- ADD CONTEXT ON RAP GENIUS.
- THROWBACK THURSDAY OR FLASHBACK FRIDAY—PICK ONE (WE PREFER WAYBACK WEDNESDAY).
- DON'T TELL PEOPLE WHEN SOMEONE FAMOUS STARTS TO FOLLOW YOU.

- NO #NOFILTER TAGS.
- AIRBNB + TINDER = SEX PARTY AT YOUR PLACE!
- DON'T SNAPCHAT SOMETHING YOU ALSO INSTAGRAM.
- CORRECT ERRORS IN WIKIPEDIA.
- NO SELFIES WITH EXOTIC ANIMALS (TIGERS) OR EXOTIC NUMBERS OF PETS (27 CATS).
- IN MEETINGS: PHONE ON THE TABLE, FACE DOWN, NOTIFICATIONS OFF. ADD A CUSTOM VIBRATION IF YOU'RE EXPECTING A CALL.
- DON'T #SUBTWEET.
- SO, DON'T START YOUR TED TALK WITH "SO."

# DRESS THE PART

In the ostentatiously casual tech world, the difference between "effortless cool" and "not even trying" is in the details. While Silicon Valley women are subject to the same fashion rules as their counterparts elsewhere, the exact way Valley men underdress says a lot about who they are. —KYLE VANHEMERT



**T-SHIRT:** Early-stage-company logo means you took a pay cut for equity. 2013 Ruby on Rails conference tee means you work for Oracle.

**GLASSES:** Warby Parker for all! (Rimless frames for dedicated hacktivists.)

**BEARD:** Five-week shadow means you do in-house UX design. Clean-shaven if you've graduated to running your own studio.

**HAIR:** Comes in two types: chrome dome or topknot.

**SHIRT:** Understated pattern, muted colors, unmistakably perfect fit.

**CARDIGAN:** Vince shawl collar says your app was bought by Dropbox. Uniqlo says it was bought by Yahoo.

**SHIRT:** Enterprise software? Still in a boxy Thomas Pink shirt to hide the belly. Sharing-economy startup? Slim-fit Steven Alan, untucked.

**HOODIE:** Black. Knit after your up round. McQueen for lunch at Battery (do you even code anymore?).

**BAG:** Timbuk2 or Rickshaw Zero with AKG noise-canceling headphones for commute coding.

**JACKET:** Barbour Bedale. Workweek-appropriate if you're under 40; after that, weekends only.

**LAYER:** Patagonia fleece for days with no partner meetings.

**BLING:** Fitbit.

**ENGINEER**

**PANTS:** Japanese selvedge denim if you're in the know, Levi's 501s if you're not. Pleated Dockers if you're a relic of the last boom.

**UX DESIGNER**

**BAG:** Filson.

**BIZ DEV**

**CAR:** Audi A4 Quattro. The Tesla is on order.

**PANTS:** Hugo Boss jeans picked out by the Nordstrom's personal shopper to go with the Pink shirt.

**SHOES:** Chucks say East Coast transplant. Vans say you never left Cali. Flip-flops say you'll program Python round the clock for fries.

**TATTOO:** Full-sleeve means you also have a terrible rock band. Venn diagram means you do data viz.

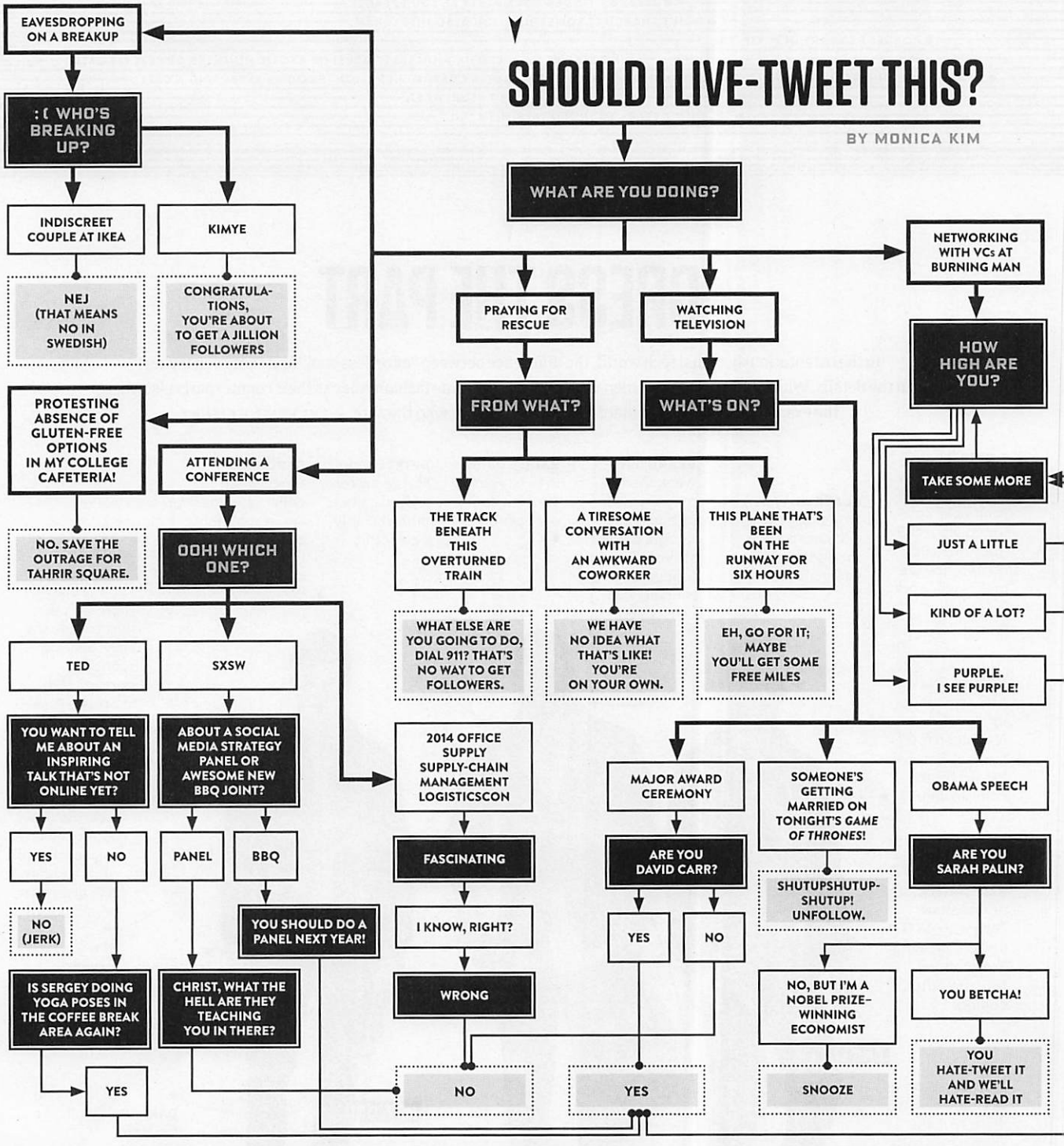
**SHOES:** Clarks desert boots (even if you're just hiking to the Google Bus stop). Fridays: Lucchese cowboy boots you bought at SXSWi.

**SHOES:** Paul Smith longwing brogues. Black if you own a house in Palo Alto; add contrasting soles if you're renting in SoMa.

DANILO AGUTOLI

# SHOULD I LIVE-TWEET THIS?

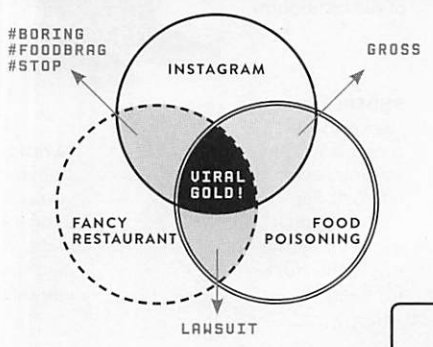
BY MONICA KIM

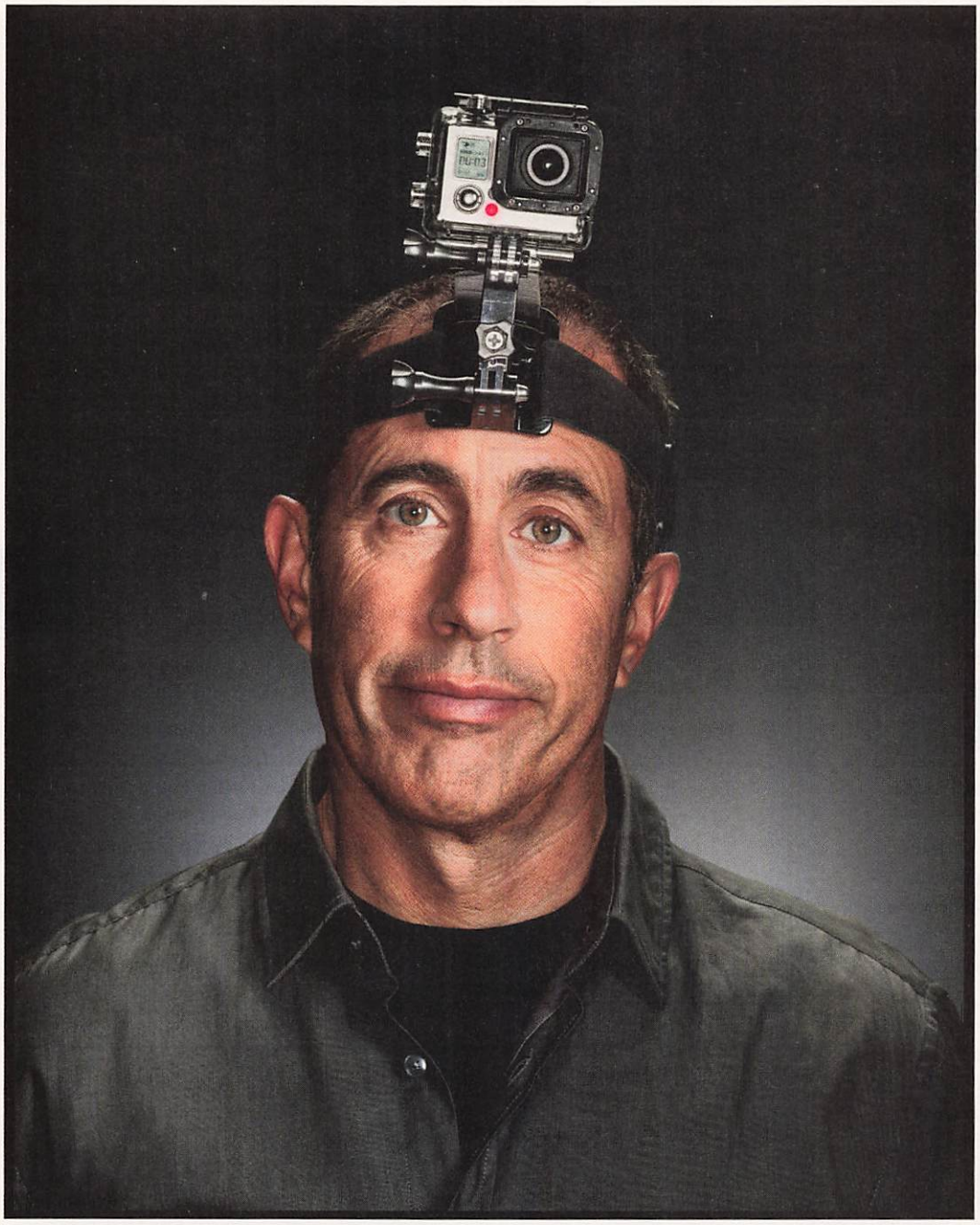

EAVESDROPPING ON A BREAKUP
:( WHO'S BREAKING UP?
INDISCREET COUPLE AT IKEA
NEJ (THAT MEANS NO IN SWEDISH)
KIMYE
CONGRATULA-TIONS, YOU'RE ABOUT TO GET A JILLION FOLLOWERS
WHAT ARE YOU DOING?
NETWORKING WITH VCs AT BURNING MAN
HOW HIGH ARE YOU?
TAKE SOME MORE
JUST A LITTLE
KIND OF A LOT?
PURPLE. I SEE PURPLE!
PRAYING FOR RESCUE
FROM WHAT?
THE TRACK BENEATH THIS OVERTURNED TRAIN
WHAT ELSE ARE YOU GOING TO DO, DIAL 911? THAT'S NO WAY TO GET FOLLOWERS.
A TIRESOME CONVERSATION WITH AN AWKWARD COWORKER
WE HAVE NO IDEA WHAT THAT'S LIKE! YOU'RE ON YOUR OWN.
THIS PLANE THAT'S BEEN ON THE RUNWAY FOR SIX HOURS
EH, GO FOR IT; MAYBE YOU'LL GET SOME FREE MILES
WATCHING TELEVISION
WHAT'S ON?
PROTESTING ABSENCE OF GLUTEN-FREE OPTIONS IN MY COLLEGE CAFETERIA!
NO. SAVE THE OUTRAGE FOR TAHRIR SQUARE.
ATTENDING A CONFERENCE
OOH! WHICH ONE?
TED
SXSW
YOU WANT TO TELL ME ABOUT AN INSPIRING TALK THAT'S NOT ONLINE YET?
ABOUT A SOCIAL MEDIA STRATEGY PANEL OR AWESOME NEW BBQ JOINT?
YES
NO
PANEL
BBQ
NO (JERK)
YOU SHOULD DO A PANEL NEXT YEAR!
IS SERGEY DOING YOGA POSES IN THE COFFEE BREAK AREA AGAIN?
CHRIST, WHAT THE HELL ARE THEY TEACHING YOU IN THERE?
YES
2014 OFFICE SUPPLY SUPPLY-CHAIN MANAGEMENT LOGISTICSCON
FASCINATING
I KNOW, RIGHT?
WRONG
NO
MAJOR AWARD CEREMONY
ARE YOU DAVID CARR?
YES
NO
YES
SOMEONE'S GETTING MARRIED ON TONIGHT'S GAME OF THRONES!
SHUTUPSHUTUP-SHUTUP! UNFOLLOW.
NO, BUT I'M A NOBEL PRIZE-WINNING ECONOMIST
SNOOZE
OBAMA SPEECH
ARE YOU SARAH PALIN?
YOU BETCHA!
YOU HATE-TWEET IT AND WE'LL HATE-READ IT

## ASK JERRY

Is it OK to video a concert with my iPad?

Sure, go ahead. So you won't enjoy the concert, and you won't enjoy the video. You will have negated everything.





## Don't Pimp Your Kid for Likes

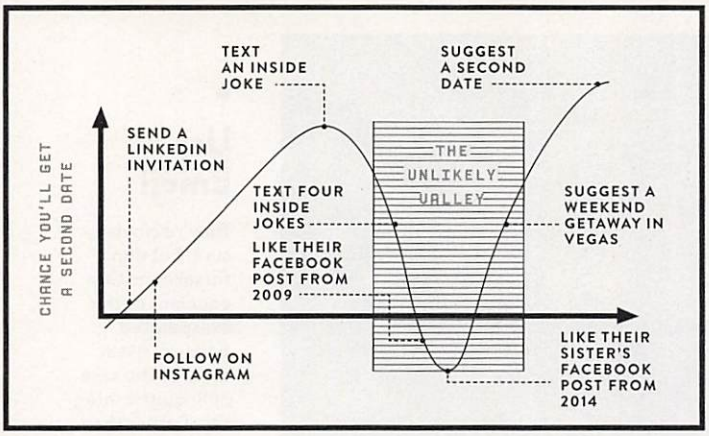
It's tempting to saturate your social media feeds with your child's awesomeness. But what begins as a desire to share your tyke's first steps can quickly devolve into a hunt for Likes, faves, and comments. At this point you have become a stage mom, with all the attendant issues. "The child may begin to feel responsible for their parent's happiness, and that's quite a burden to carry," says Leslie Anderson, a University of Manitoba researcher who has studied child actors. So, yes, share some cute pictures. But don't set your kid on the same path as the cast of *Diff'rent Strokes*. —BRENDAN I. KOERNER

**DON'T USE BOTS TO MAKE RESTAURANT RESERVATIONS. THEY'RE GETTING IN THE WAY OF *OUR* RESERVATION BOT.**

## Use Emoji

They're cloying, sure, but don't forsake the tiny eggplant or the exasperated bead-of-sweat face for the sake of linguistic integrity. Rather than cheapening language, emoji make it better. According to Tyler Schnoebelen, a Stanford-trained linguist whose dissertation analyzed emoticons, those little symbols can add crucial context, standing in for the smirks and shrugs that help us convey meaning in face-to-face conversation. But emoji let us express ourselves in new ways too—including, perhaps, ones that the previous generation of emoticons could not. A message to a potential paramour followed by a ;) is about as suave as asking if it hurt when she fell from heaven. The same come-on with a 😳 to acknowledge your brashness is less obvious. Granted, emoji lack the codification and grammar generally associated with language. That slipperiness, though, is part of what makes it worthwhile. Linguist Ben Zimmer refers to this as emoji's Wild West era; with every new message, we have the chance to play with meaning and experiment with expression. 👍 —KYLE VANHEMERT

- GOPRO IS FOR SNOWBOARDING AND SKYDIVING, NOT FIRST DATES.
- IF YOU GET KNOCKED BACK TWICE ASKING FRIENDS FOR LIVES ON *CANDY CRUSH SAGA*, GIVE UP.
- ENDORSE PEOPLE FOR FUNNY SKILLS YOU'VE ADDED ON LINKEDIN: GUNRUNNING, GATE CRASHING, BIRDHOUSE BUILDING.


TEXT AN INSIDE JOKE
SUGGEST A SECOND DATE
SEND A LINKEDIN INVITATION
THE UNLIKELY VALLEY
TEXT FOUR INSIDE JOKES
SUGGEST A WEEKEND GETAWAY IN VEGAS
LIKE THEIR FACEBOOK POST FROM 2009
CHANCE YOU'LL GET A SECOND DATE
FOLLOW ON INSTAGRAM
LIKE THEIR SISTER'S FACEBOOK POST FROM 2014

# DON'T ASK IF YOU CAN VAPE

You're at a friend's house and feel the urge to toke on your ecigarette. Don't ask, just light up. Vaping is about as intrusive to your hosts as chewing gum or a bold perfume. You wouldn't ask before spraying on the Sex Panther, right? Of course not. And science is on your side, in terms of your habit's harm to those around you. A study published in the peer-reviewed *Nicotine & Tobacco Research* concludes that the nicotine levels in secondhand ecig vapor are about 10 times lower than what's in exhaled cigarette smoke. And the mist contains no ash or tar or anything like that. Plus, there's hardly any smell. ¶ True, you'll be emitting a little bit of propylene glycol, an ingredient used in stage fog. But while the science is out on what the stuff will do to you if you smoke a ton, it's not going to do anything to your friends. ¶ The need to ask, in this case, is anachronistic. Your friends will be plenty miffed by your silence, but that's OK. You protected them from having to give overt approval to a questionable habit. Only a jerk would put their hosts in a position like that. —NICK VERONIN

**DO NOT REPLY ALL.**

# Watch R-Rated Movies on Planes

Thanks to tablets and new FAA rules you can now watch *The Walking Dead* from gate to gate. But should you? The person in the adjacent seat might be the sort who takes offense at anything racier than *Dancing With the Stars*, a show notably lacking in rotting flesh and beheadings. ¶ The answer: It's fine. Coach class isn't a Puritan church service, and you shouldn't feel ashamed about watching video with a little bump-and-grind. Your real concern is noise. "The biggest complaint we get about electronic devices, by far, is that they're too loud," says Shawn Kathleen, a veteran flight attendant who runs a blog called *Rants of a Sassy Stew*. We're pretty good at keeping our eyes to ourselves while flying, but not so much our ears. So while an occasional flash of buttocks is fine, make sure that nothing audible (movie, music, or personal chortle) disturbs your neighbors. ¶ The "images good, noise bad" maxim will also serve you well once cell phone service is allowed at altitude. Texting will be fine, but talking will be an offense punishable by feeding your bowels to the undead. —BRENDAN I. KOERNER

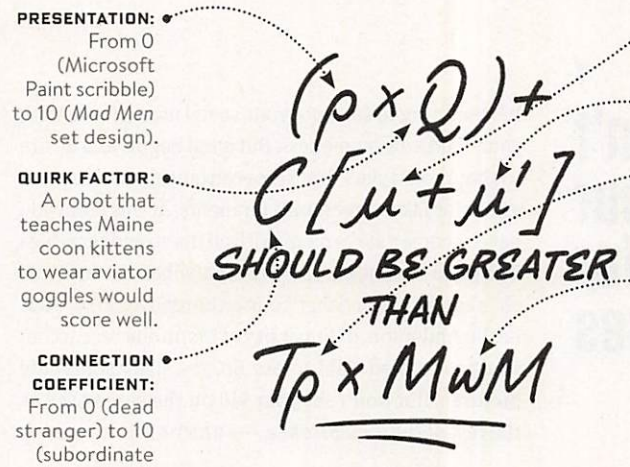
## ASK JERRY

I think my neighbor is feeding my cat. Is it OK to use a drone to spy on him?

Yes, that is cool. What would be even cooler is if the cat got in the drone and started spying on you.

## Beg for Money on Kickstarter

**Your 3-D-printed, Internet-of-Things-connected, self-driving go-cart idea needs money to move ahead. Behold the formula for a successful crowdfunding campaign. –JAMES MCGIRK**




**PRESENTATION:** From 0 (Microsoft Paint scribble) to 10 (*Mad Men* set design).

**QUIRK FACTOR:** A robot that teaches Maine coon kittens to wear aviator goggles would score well.

**CONNECTION COEFFICIENT:** From 0 (dead stranger) to 10 (subordinate conjoined twin).

**PHYSICAL UTILITY:** Tangible benefit to donor.

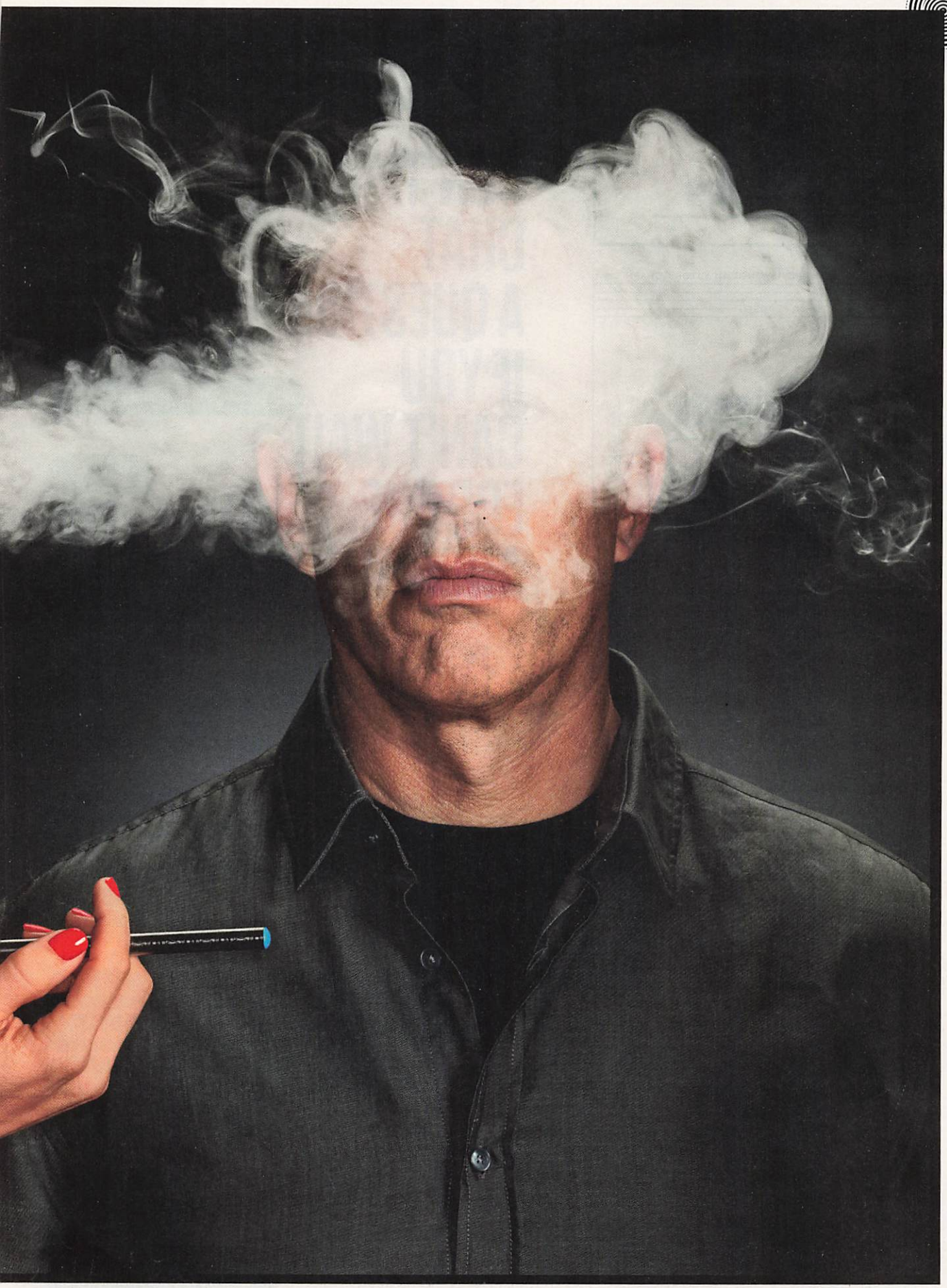
**PSYCHIC UTILITY:** Intangible benefit.

**FREQUENCY:** Times you've hit them up for money.

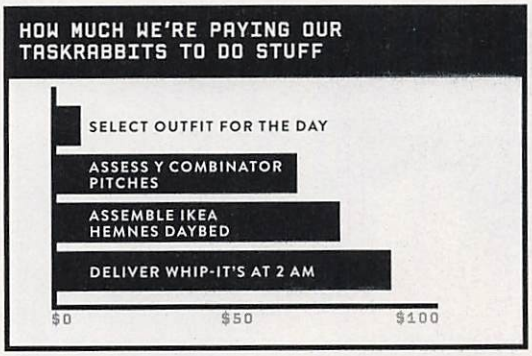
**MONEY WOE MULTIPLIER:** Factor by which donor's rent exceeds the national mean, multiplied by their student-loan debt.

0 9 2

LETTERING BY MATTHEW TAPIA



- NO POSTING ULTRASOUND PHOTOS ON FACEBOOK. EXCEPTION: TRIPLETS.
- NO POSTING ONE-NIGHT-STAND PHOTOS ON FACEBOOK. EXCEPTION: TRIPLETS.




- ON YELP: IT'S A RESTAURANT REVIEW, NOT AN AUTOBIOGRAPHY.
- DON'T USE YELP.
- TIP 20 PERCENT.

# Correct Friends Who Are Wrong on the Internet

Alongside the Buzzfeed quizzes, baby pictures, and thinly veiled ads in your News Feed lurks an even greater evil: misinformation. In the past, conspiracy theorists could espouse their kooky ideas to friends—and that'd be the end of it. Now that their insanity can be broadcast to the world (and picked up by less-discerning news purveyors), it's worth calling them on their bullshit. But how do you fight for the truth without turning into a full-time fact-checker? ¶ "Internet discussions suck because we aren't good at having arguments," says David McRaney, author of *You Are Not So Smart*. "People are having to relearn the tools of argumentation, logic, and civics." We'll assume you have the logic stuff down. But research into decision-making says viral content is all about emotions. So as much as you want to lay down some cold, hard facts, you have to address the feelings that led someone to post the bogus information. ¶ McRaney says a social persuasion technique called Feel, Felt, Found—commonly used by salespeople to "manage rapport"—can help: *"Wow, I totally see why you FEEL that chupacabras are a real threat. I FELT concerned for my goats too! But then I FOUND this video about how it's a hoax ..."* Then back off—for the sake of your time and your argument. Pushing it just makes people dig in and more tenaciously defend their beloved chupacabras. —GWEN PEARSON

**UNLESS U R ♀, USE FULL WORDS IN TEXT MESSAGES.**

# DON'T CHAT A QUESTION IF YOU CAN'T WAIT FOR THE ANSWER

BY EMILY DREYFUSS

Should we do something for Kev's bachelor party, or what?

Dude something hug elikea weekend somewhere--tahoe maybe?

Sent at 11:55 a.m.

no?

vegas then i can totally plan it

Sent at 11:56

if you're busy

Sent at 11:57

only if you're cool with it

i'll get a stretch limo and a big suite

Sent at 11:58

good idea?

hello?

wait, do you not want me to plan it?

you don't think I can handle it?

you're still not over it?

dude, tijuana jail is totally different from tijuana prison!

three days really isn't that big of a deal, come on!

Sent at 12:04 p.m.

i cannot believe after all this time you're still holding that weekend against me

i paid your parents back the bail money

it just took a while

Sent at 12:13

but you know what? Look, I'll say it. it wasn't all my fault

like yes, I technically stole the boat, but who ran it aground?

dude, who was the one trying to impress those girls?

i wanted to look at coral, dude

Sent at 12:20

plus! I'm older now

this is messed up

i can plan a stupid trip to vegas

you don't trust me?

Sent at 12:26

you're an asshole

Sent at 12:26

whoa, dude, what? i had a noon meeting

uh?

you can plan it if you want

I don't care

Sent at 12:34

oh cool

it'll be epic

i'll get a stretch hummer

sound good?

hello?

Sent at 12:34

you there?

Sent at 12:35

# GO AHEAD AND ASK OTHERS FOR THEIR DNA RESULTS

For most people, low-cost genetic sequencing makes getting your personal DNA profile a no-brainer. But the real value is in *everybody else's* genetic data. A mutation that suggests a higher risk of kidney disease doesn't mean much on its own—but a family member with the same mutation and active disease means you should be monitored. So bite the bullet: Ask your relatives to get their DNA sequenced. ¶ Sure, it might be awkward to grill Aunt Mabel about her chromosomes, but here's the upside: She can learn more about her disease risk, and you get to factor her mutations into your own health calculations. Think of it like any other medical data, says Jennifer Hoskovec, president of the National Society of Genetic Counselors: If you'd inquire about your aunt's diabetes, then As, Cs, Gs, and Ts are all fair game. —BRET STETKA

**DON'T DESCRIBE YOURSELF AS A GURU/NINJA. EXCEPTION: IF YOU READ SANSKRIT OR KILL PEOPLE WITH THROWING STARS.**

## Share Your Fitness Data If It's Good, Not If It's Great

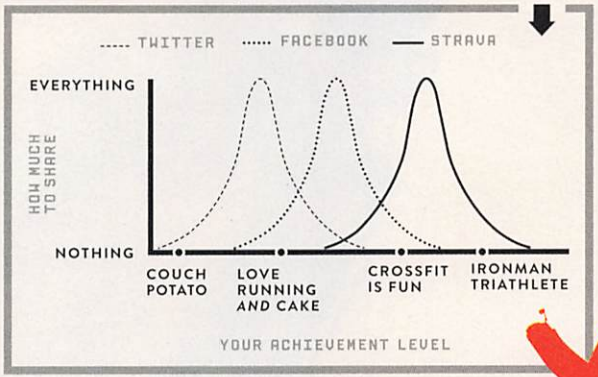
Your Fitbit tells you that you've taken 20,000 steps today. You should tell all your friends, right? Not so fast, Walkin' Dude. The main reason people quantify themselves is for self-improvement, and competition is a part of that—it's adding a macro-level feedback loop to the micro-level one between you and your wristband. But being part of that community means being a good citizen: Bragging about your Olympian scores will make others give up. Ditto for subhuman performance—that encourages everyone to slack off.

So quantify your quantification with the bell curves below. Share when your performance is just above average for your demographic, and confess if your slippage drops you a bit below par. (You're taking advantage of what psychologists call the superiority illusion to help your friends. Most people think they're better than average, so if you bump up their perception of average, you're also bumping up their self-regard—hopefully with positive health results.) And consider your social medium: Assume a high fitness level for your Quantified Self pals and share your most impressive numbers with them. On Facebook, drop it down a notch to accommodate your asthmatic cousin. And on Twitter—well, your Twitter followers could be anyone, so go easy on those guys. Anything more is quantified selfishness. —JONATHON KEATS

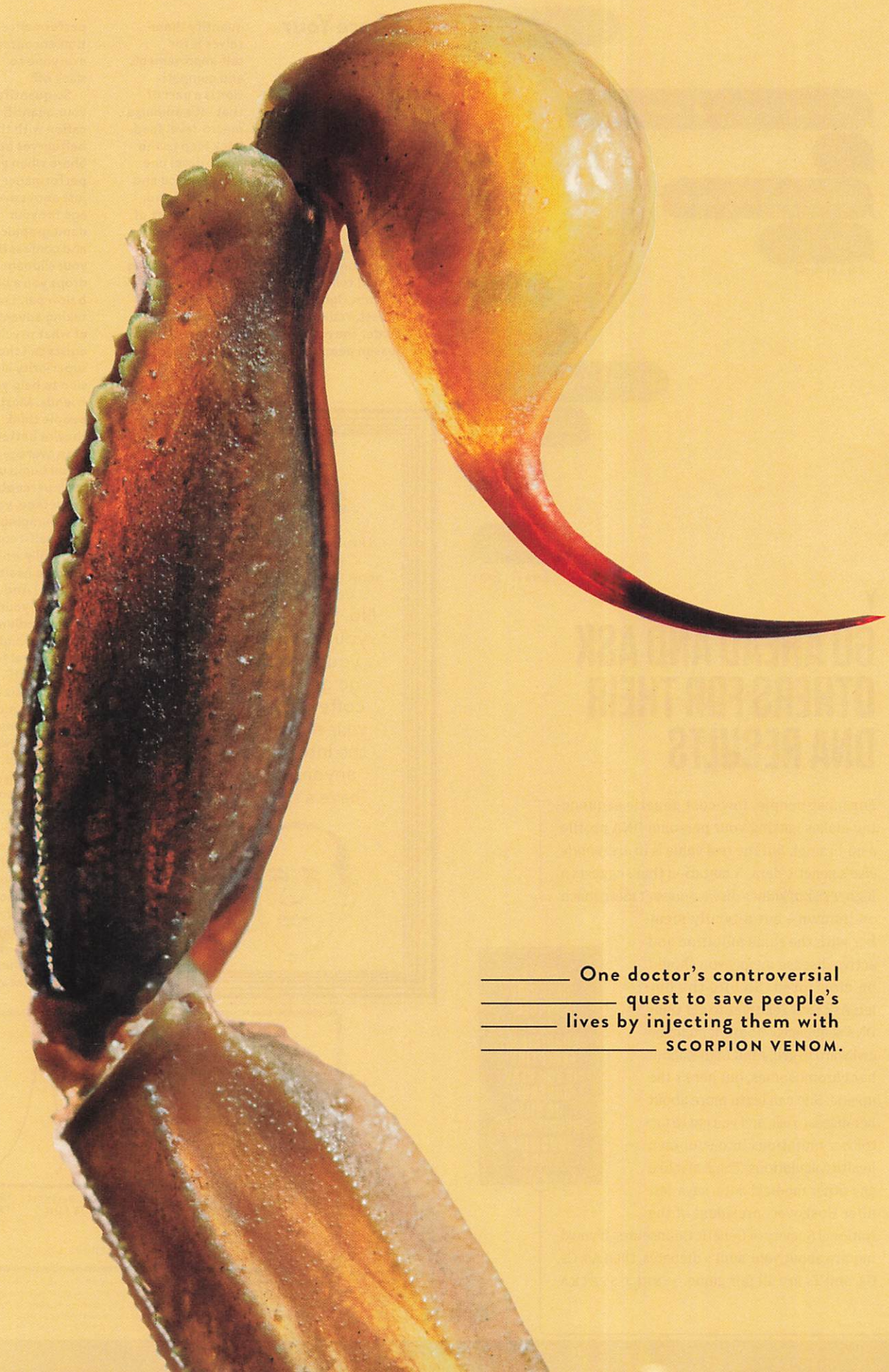
## ASK JERRY

I like coffee and cars. Can I be on your show *Comedians in Cars Getting Coffee*?

No. Here's what you do: Get in your car and go get some coffee. That's *your* show. It's the Internet—anyone can have a show.

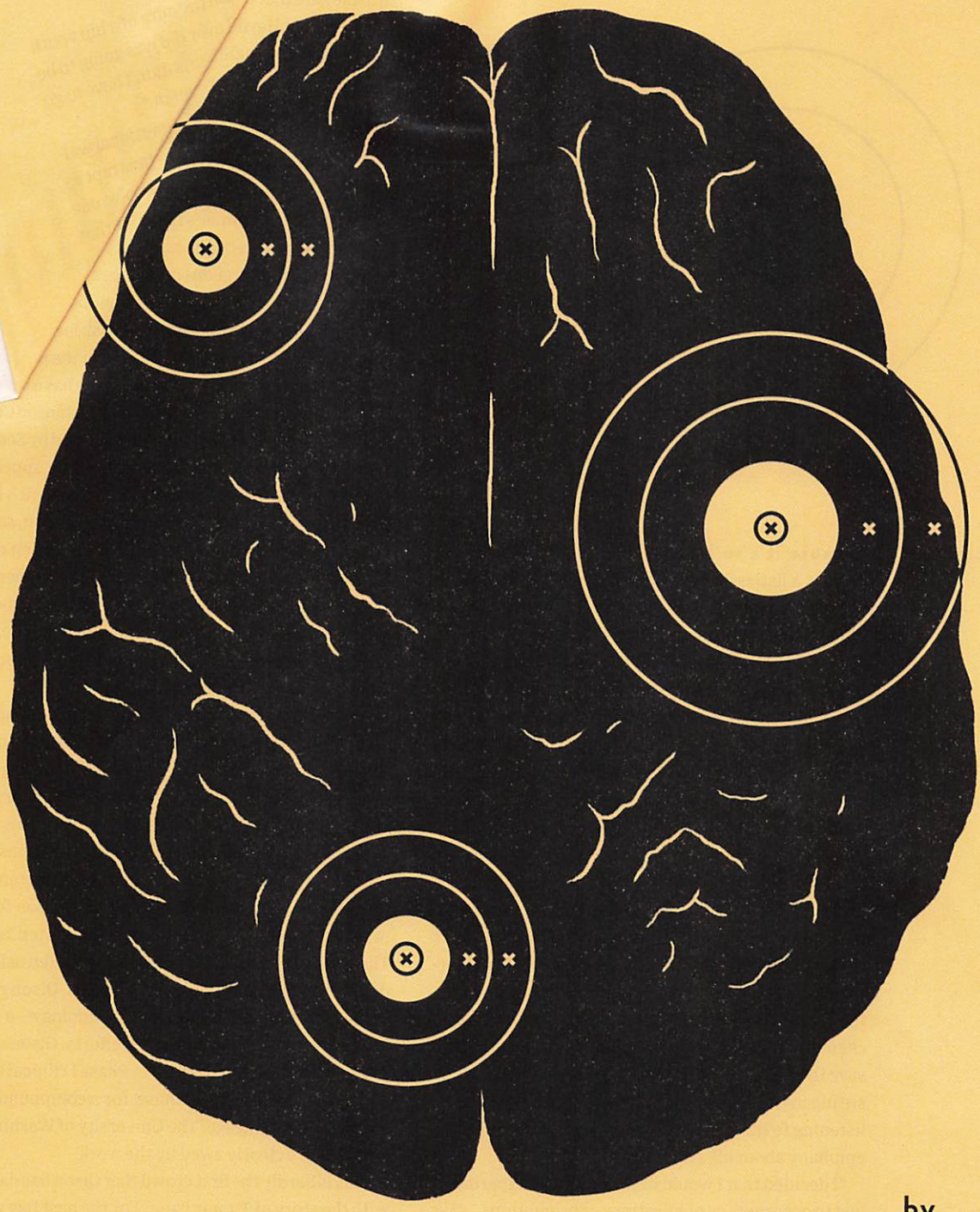



PROP STYLING BY ANDREA HUELSE/ART DEPARTMENT; STYLING BY MINDY SAAD/CELEBRITINE AGENCY; GROOMING BY REBECCA RESTREPO/THE WALL GROUP; PHOTOGRAPHED AT PIER59 STUDIOS, CHELSEA PIERS, NYC. COVER: JOHN VARVATOS JACKET; BLOOMINGDALES T-SHIRT. HOODIE: OLD NAVY. MUSTACHE: HUGO BOSS/BLOOMINGDALES JACKET; JAMES PEARSE T-SHIRT. VAPOR: BLOOMINGDALES SHIRT; JAMES PEARSE T-SHIRT.



One doctor's controversial quest to save people's lives by injecting them with SCORPION VENOM.

# HARD TARGET

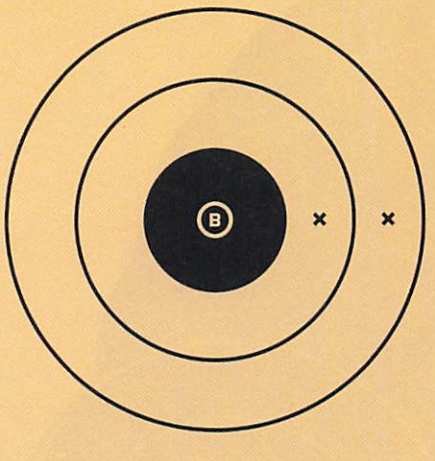


by

BRENDAN I. KOERNER

097

Christopher Griffith



**Because it's so late on a MONDAY afternoon,** there is a listless vibe inside the University of Washington lecture hall where Jim Olson is about to speak. The audience consists of a few dozen grad students struggling with end-of-day fatigue. They scarf down free chocolate-chunk cookies as they prepare to take notes, but sugar can sharpen mental alertness only so much. The talk they've come to hear, part of a biweekly series on current topics in neuroscience, doesn't exactly seem like edge-of-your-seat material.

Olson's first slide wakes them up. It is a pixelated photograph of an adorable 6-year-old boy named Hayden Strum, who sports a white Quiksilver T-shirt and a pirate-style eye patch. Hayden, who suffered from a pernicious brain tumor, came to Olson in 1995, back when Olson was just starting his career as a pediatric oncologist and cancer researcher. For four years, the doctor treated Hayden with successive rounds of chemotherapy and major surgeries, but nothing could save the boy's life. Olson tells the audience that while sitting in the back row at Hayden's memorial service, listening to the speakers express their pain, he had an epiphany about his scientific priorities.

"I decided that I would never design an experiment just to get grants or publications or promotions," says the 51-year-old Olson, whose ruddy complexion and Midwestern genial
minister. "Every expe
to make sure that other b
through what Hayden had

Having been caught off gua
lop of his opening story, Olson's
he goes on to describe a decade-lon
of the most vexing problems in oncol
a tumor's precise boundaries are nearly
define during surgery. A preoperative MRI p
a rough guide to a tumor's fuzzy edges; the sc
miss slivers of cancer that seamlessly blend into t
rounding tissue. Surgeons often face a brutal catch-
Either cut out any suspicious tissue, an approach that ca
lead to debilitating side effects, or risk leaving behind
malignant cells that will eventually kill the patient.

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Olson tells the students that he finally has a solution. His laboratory at the renowned Fred Hutchinson Cancer Research Center, located just down the road by Seattle's Lake Union, has developed a compound that appears to pinpoint *all* of the malignant cells in a patient's body. It gives those cells a bright fluorescent sheen, so that surgeons can easily spot them in the operating room. Olson calls the product Tumor Paint, and it comes with a surprising twist: The compound's main ingredient is a molecule that is found in the stinger of *Leiurus quinquestriatus*, a potent little animal more popularly known as the deathstalker scorpion.

A scorpion-venom concoction that makes tumors glow sounds almost too outlandish to be true. In fact, Olson explains, that's what troubled the big grant-making organizations when he came to them for funding. But when those organizations dismissed his ideas as too bizarre, Olson started accepting donations from individuals—particularly the families of current and former patients—quickly raising $5 million for his research. It was a bold and unprecedented tactic: Though patients and their families are often asked to donate to foundations with broad goals, Olson raised money for one specific, untested technology—a much riskier gamble. But thanks to his efforts, Olson's fluorescent scorpion toxin is now in Phase I clinical trials, an impressive accomplishment for a compound with such a peculiar lineage. The University of Washington students are clearly awed by the work.

This is hardly the first crowd that Olson has dazzled with the story of Tumor Paint. For the past few years, he has been delivering his pitch from coast to coast, often at buzzy general-interest conferences such as PopTech and South by Southwest. These poignant presentations and the attendant media coverage have earned Olson a small measure of fame—enough, for

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*Contributing editor* **BRENDAN I. KOERNER** (@brendankoerner) *wrote about the need for spectrum domination on the battlefield in issue 22.03.*

PREVIOUS: BRAIN ILLUSTRATION BY PETER DUMANSKI; DEATHSTALKER WRANGLING BY GOD OF INSECTS

example, so that he was featured in a short documentary that screened at the 2013 Sundance Film Festival. They've also earned him additional funding: Olson always ends his talks by urging his audience to visit his crowdfunding platform, Project Violet, where they can make direct donations to his lab.

Both his idea and his approach to funding it make Olson something of a maverick in the field of cancer research. There are critics who worry that the oncologist might be offering more hope than he can deliver—particularly to the desperate loved ones of his patients. But Olson's mission is to prevent more kids from suffering Hayden Strum's fate, and to do that, he says, he must rely on families who possess intimate knowledge of what's at stake. "Without them," he says, "Tumor Paint wouldn't exist. Simple as that."

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Jim Olson was just 4 when he discovered the book that made him want to be a doctor. It was a vintage medical encyclopedia that he had pulled off the shelves of his family's home in Escanaba, a town on the southern coast of Michigan's Upper Peninsula. In the center of the book was a clear plastic page embossed with a portrait of a human body. The next page had a depiction of the body with its skin stripped away, followed by a drawing of the circulatory system and then the vital organs. Enthralled by the act of flipping through the human anatomy layer by layer, Olson knew that he wanted to grow up to be one of those wise men with stethoscopes who get to tinker with muscle, blood, and bone.

A career in medicine was an ambitious goal for Olson given his family's circumstances. His father, an electrician by trade, had a serious drinking problem at the time that wreaked havoc on Olson's parents' marriage. After they divorced when Olson was 7, his mother supported her two children with a minimum-wage clerical job at an insurance company; the kids often subsisted on black-bear roasts provided by their uncles, who were avid hunters. When Olson matriculated at Western Michigan University in the fall of 1981, he became the first member of his family to attend college.

Olson excelled at Western Michigan, graduating from the school's honors program in three years. For most of his college career, his long-term plan was to earn a medical degree and then return to Escanaba to become a family doctor. But late in his senior year he decided that he didn't want to spend his life sewing sutures in his provincial hometown. He instead opted to enroll in the University of Michigan's prestigious MD-PhD program, which would prepare him to become a scientist as well as a clinician.

Toward the end of the MD portion of the program, Olson was the med student assigned to the case of a 7-year-old girl with a rare and devastating neurological disorder. The girl was losing cranial nerve functions every day, and it was clear that she would soon die unless she was connected to a ventilator—something her parents opted not to do. On the day the girl died, Olson walked from the hospital to the university's arboretum, where he intended to mourn privately amid the trees. He was surprised to discover that he felt little sorrow.

"I was remarkably high-spirited," Olson recalls. "And that was really odd to me, because this was the first time I'd had a child die on me." While meditating by the Huron River, Olson realized how much he had been moved by something the girl's parents had said to him a few hours earlier. They told Olson that the way he had cared for their daughter helped them see that a person needn't live until 80 for their life to have been a triumph. Recognizing his ability to deal with despair, Olson decided that he was meant to become a pediatric oncologist, a specialty that rewards a philosophical approach to tragedy.

**A scorpion-venom concoction that makes tumors glow sounds too outlandish to be true. At least that's what the grant-making organizations thought.**

Olson would end up pursuing that specialty in the Pacific Northwest, where he moved in 1991 to take a residency, and later a fellowship, at Seattle Children's Hospital. Despite his high tolerance for heartbreak, though, Olson was battered by his first full year of caring for dying kids. Pent-up grief would overwhelm him at odd moments; he once turned into a blubbering mess upon discovering that the tomato plants in his front yard were afflicted with blight. "I can't even take care of a plant!" Olson thought as he kneeled in the dirt by his discolored tomatoes.

In 2000 Olson established his own lab at Fred Hutchinson, where he could channel his emotions into finding ways to increase his patients' odds of survival. Initially the lab focused on conventional projects, such as investigating whether existing drugs could inhibit cancer cell growth. But its research took a novel turn in May 2004, after Olson and several other Seattle Children's oncologists met to review the case of a shy and studious 17-year-old girl who had recently undergone brain tumor surgery. When the doctors examined the girl's MRI scans, they made a depressing discovery: Despite the surgical team's painstaking work, a thumb-sized chunk of cancer cells remained inside her head.

The realization was disheartening but not unexpected. "You know, a tumor doesn't have a big sign that says 'Here I Am,'" says Steven Rosenfeld, director of the Brain Tumor Research Center of Excellence at the Cleveland Clinic. "An MRI can be helpful, but it doesn't identify all of the microscopic deposits and nests where the tumor occurs." Neurosurgeries are particularly tricky because the brain has a gelatinous consistency—surgeons compare it to a wobbly slab of Jell-O. Poking and prodding an exposed brain with sharp instruments alters its shape, thereby rendering MRI images useless as guides.

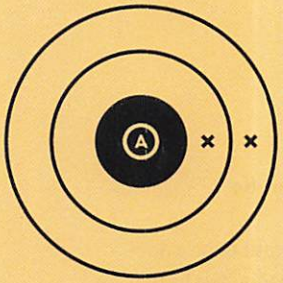
As soon as the meeting adjourned, Olson was beckoned aside by Richard Ellenbogen, the neurosurgeon who had performed the girl's operation. He was visibly frustrated by the outcome. "You've got to find some way to help us see these cancers better," he implored Olson.

Olson instantly thought back to his University of Michigan dissertation. The paper was about the use of a radioactive isotope in PET scans that can diagnose cancers. The isotope is employed as a tracer that will emit detectable gamma rays upon reaching its target within the body, helping determine if a certain type of cancer is present. Olson now wondered whether he could devise a similar technique to illuminate cancers with simple beams of light, so that malignant cells would shine not just on PET scans but also during actual surgeries.

Olson thought he could accomplish this feat by modifying a molecule known to bind specifically to cancer cells. If he could attach a fluorescent dye to such a molecule, maybe he could make the tumors glow a brilliant blue or green when viewed through a near-infrared camera positioned next to the operating table. Surgeons would then have no problem seeing exactly where a tumor began and ended.

Since he needed someone to spearhead the search for an appropriate molecule, Olson borrowed one of Ellenbogen's top neurosurgery residents, a meticulous young man named Patrik Gabikian. Olson put Gabikian to work as a sleuth, asking him to comb through all existing databases in the hopes of unearthing a molecule that would latch onto tumor cells while ignoring the healthy cells around them. Every night, Gabikian would hand his new boss a list of candidates that he'd discovered that day. And for six exasperating weeks, Olson would reject each molecule for any number of reasons—a structure that made it too difficult to attach a dye to, for example, or the likelihood of adverse side effects elsewhere in the body.

Olson's interest was finally piqued by one of Gabikian's more peculiar suggestions: chlorotoxin, a substance found in the venom of the deathstalker scorpion. Despite its unusual background, the molecule was already a budding star in the biotech world.



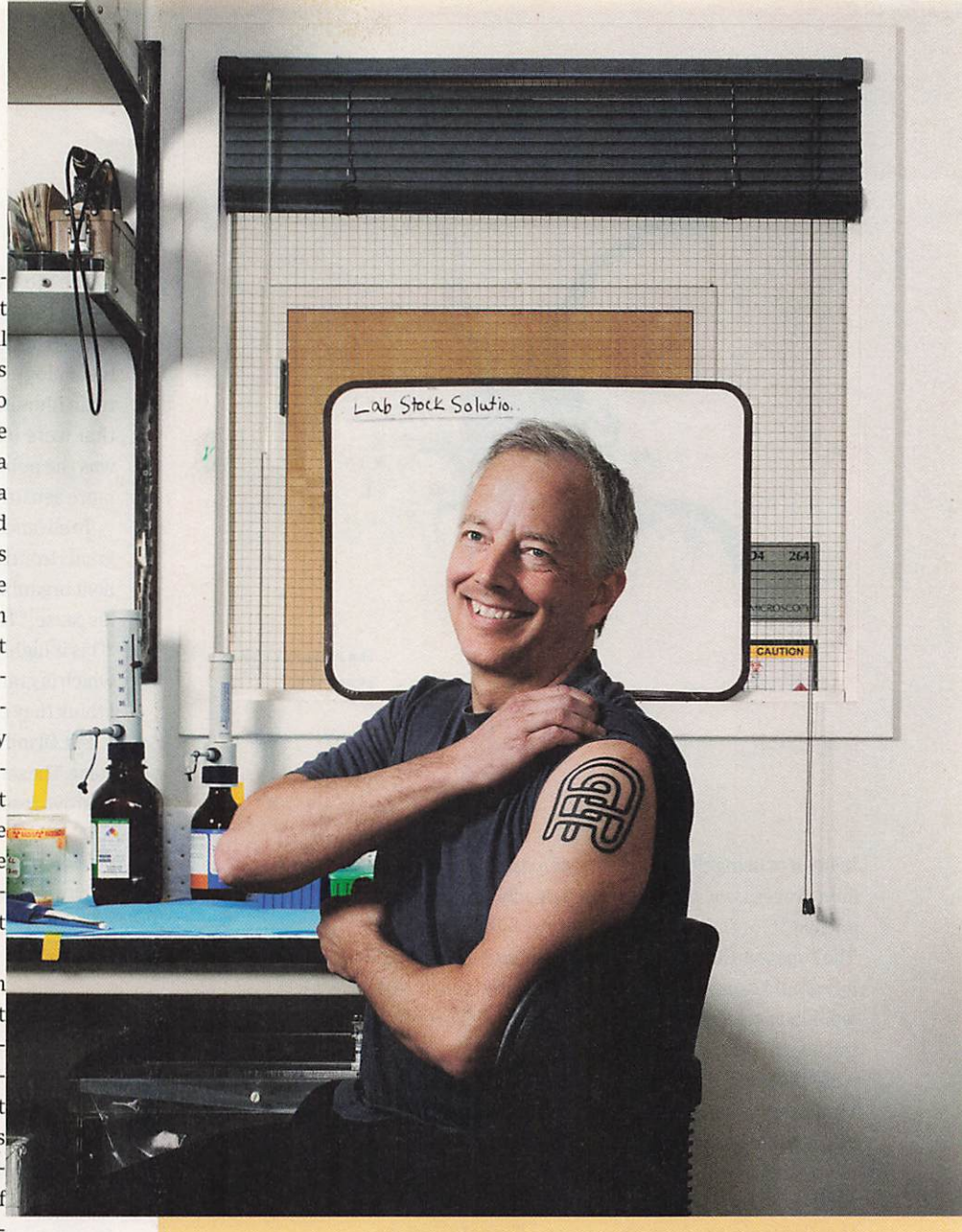

**Ancient practitioners of MEDICINE were well** aware that scorpion venom could heal as well as harm. In imperial China, for example, the cloudy fluid was used to treat ailments ranging from mumps to tetanus. And in certain rural corners of India, whole scorpions were dipped in mustard oil and then rubbed on arthritic joints. Scorpion venom has more recently become an object of fascination for developers of pesticides, who dream of protecting crops using the neurotoxins that scorpions employ against locusts and beetles.

Today pharmaceutical companies regularly obtain venom for commercial use by milking deathstalkers—that is, jolting the yellow arachnids with electricity, then collecting the droplets that dribble forth from their tails. Courage is an essential trait for the technicians who handle this sort of work, for the deathstalker is among the most dangerous scorpions in the world: In certain instances, *L. quinquestriatus* venom can cause cardiac arrest.

Scorpion venoms are cocktails of numerous individual toxins, which attack different targets within a victim's body. The initial American research on the deathstalker's venom focused on these toxins' ability to block electrical signals generated by the movement of sodium ions. Then, in 1993, a team at Harvard Medical School identified a new *L. quinquestriatus* toxin that appeared to block the channels that cells use to pass chloride ions across their membranes. The researchers noted that this molecule, which they dubbed chlorotoxin, consists of a short chain of amino acids—a peptide, in biochemical parlance. At the center of this particular 36-amino-acid peptide is a tightly packed structure consisting of four disulfide bonds, which gives the molecule a knot at its core. Despite its ominous name, pure chlorotoxin is harmless to humans; its sole evolutionary purpose seems to be to paralyze the muscles of the cockroaches that the deathstalker likes to eat.

In 1994 the Harvard researchers' paper in the *American Journal of Physiology* caught the eye of Nicole Ullrich, an MD-PhD student at the University of Alabama at Birmingham. (She is now a neuro-oncologist at the Dana-Farber/Boston Children's Cancer and Blood Disorders Center.) Ullrich was investigating a nasty type of brain tumor called glioma, whose sufferers have a five-year survival rate of just 5 percent. Glioma cells move through the brain by contorting their shapes, a feat they pull off by secreting chloride ions—a bit like plump sausages becoming slinkier as their salty juices cook away. Ullrich hypothesized that the tumors could be held in check if there were a drug capable of blocking their ability to "sweat" chloride. Chlorotoxin promised to do just that.

When she injected chlorotoxin into the brains of mice with gliomas, Ullrich found that the peptide would bind *only* to the cancer cells; the molecule wanted nothing to do with the normal cells adjacent to the tumors. When she shared this serendipitous behavior with her lab's director, a neurobiologist named Harald Sontheimer, the two began to dream big about chlorotoxin's potential. "When a patient comes in and they're symptomatic for glioma, the invasion of the tumor to other parts of the brain has already begun," Sontheimer says. "So




JIM OLSON shows off his tattoo, which represents the knot of disulfide bonds at the center of the chlorotoxin molecule.

JOHN CLARK

DEATHSTALKER scorpion

instead of using this as a drug just to inhibit that invasion process, we wanted to put a deadly payload on it and use it for the targeted delivery of cellular poison." The hope was that this new form of targeted chemotherapy would cause no side effects, since the chlorotoxin wouldn't accidentally transport any of that cancer-killing poison into healthy cells.

By the time Jim Olson and Patrik Gabikian stumbled upon chlorotoxin in 2004, a decade after Ullrich's initial encounter with the peptide, Sontheimer's chlorotoxin-based drug had completed Phase I clinical trials. Those trials yielded such promising results that Sontheimer's biotech company, TransMolecular, was able to secure $33.2 million in venture capital as it prepared the drug for Phase II. Olson, by contrast, could only dream of such lavish funding as he began to design his initial chlorotoxin experiments. He had to bargain hard just to afford a few hundred milligrams of the peptide from an Israeli pharmaceutical company. Even after an intense round of negotiation, Olson had to pay $100,000 for his chlorotoxin.

But this big expenditure was justified by the experimental results. Olson and Gabikian found that the chlorotoxin didn't attach just to brain tumors—it grabbed onto all sorts of cancers, from those that affect the skin to those that destroy the lungs. They also learned that the peptide could cross the barrier that protects the brain from toxins and other chemicals—a rare attribute for a molecule of its size, and one that Olson credits to the fact that scorpions have had millions of years to evolve methods to infiltrate their prey. This capability meant that the peptide could be administered intravenously rather than injected locally into the brain.

The most incredible revelation came when Olson began to inject fluorescent-tipped chlorotoxin into mice—the compound lit up cancer cells that no other technology could identify. In one instance, the chlorotoxin illuminated a clump of just 200 malignant cells that were burrowed deep within a wad of fat. "That was the point we learned that the technology was far more sensitive than an MRI," Olson says.

To advance his chlorotoxin research, Olson applied for grants from the National Cancer Institute and other eminent organizations. But not a single one agreed to back his cause. "The rejections were based on comments like 'This is highly speculative' or 'This is highly ambitious,' which is grant code for 'They are proposing more than I think they can accomplish,'" Olson says.

But Olson had supreme confidence in chlorotoxin's value. The series of rejections just led him to conclude that creative research such as his required creative funding.

ELEVEN-YEAR-OLD CARSON knows exactly what's coming next, which is why he's hunched over and retching on the edge of the exam table. His father, a brawny Navy sailor, tries to soothe the boy by tenderly rubbing his back. But the massage can't stop the digestive spasms, the physical manifestation of Carson's dread of the toxic chemicals that will soon be pumped into his body.

Olson places a wastepaper basket beneath the boy's chin as he assures the father that this sort of Pavlovian response is common among chemotherapy patients. "There's a story of a patient, 30 years later he walks into a restaurant and he sees the doctor who treated him," Olson says. "He goes over to the doctor's table to say hi, and as soon as he opens his mouth he vomits all over everything. The memory, it can really be that strong."

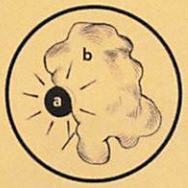
The darkly comic anecdote eases the tension in the room, in part because it hints at the best possible outcome for Carson—one in which the blond and freckled preadolescent will reach a healthy middle age. That future is far from guaranteed, because Carson was born with neurofibromatosis, a condition that causes tumors

## PAINTING TUMORS

**Brain surgeons can't easily distinguish a tumor from healthy tissue. JIM OLSON's TUMOR PAINT solves this problem by giving tumors an eerie and distinct fluorescent glow.** –JASON KEHE

**Step 1**

Olson needed a compound that would locate only tumor cells. The answer: chlorotoxin, a (nontoxic to humans) molecule found in the venom of the deathstalker scorpion.

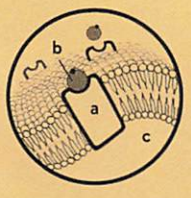



**Step 2**

Chemists attach a fluorescent dye—the FDA-approved indocyanine green (a)—to laboratory-made chlorotoxin (b). The resulting compound glows in near-infrared light.

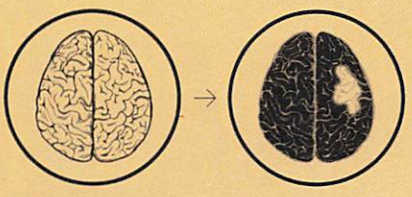
**Step 3**

Before surgery, Tumor Paint—which can cross the blood-brain barrier—is injected into the patient's bloodstream through an IV and begins circulating within the body.




**Step 4**

The outsides of tumor cells contain a protein healthy cells don't: Annexin A2 (a). Research shows chlorotoxin (b) binds to Annexin A2 and from there seeps into tumor cells (c).



**Step 5**

It can take an hour or two for enough of the compound to accumulate in a tumor to be useful. Even then surgeons still can't see their targets with the naked eye. Instead, they point a near-infrared laser at the area—often in the hard-to-operate-on brain—and a special camera captures the light emitted from the Tumor Paint. Tumors appear on a monitor as ghostly-green blobs.

JOE McKENDRY

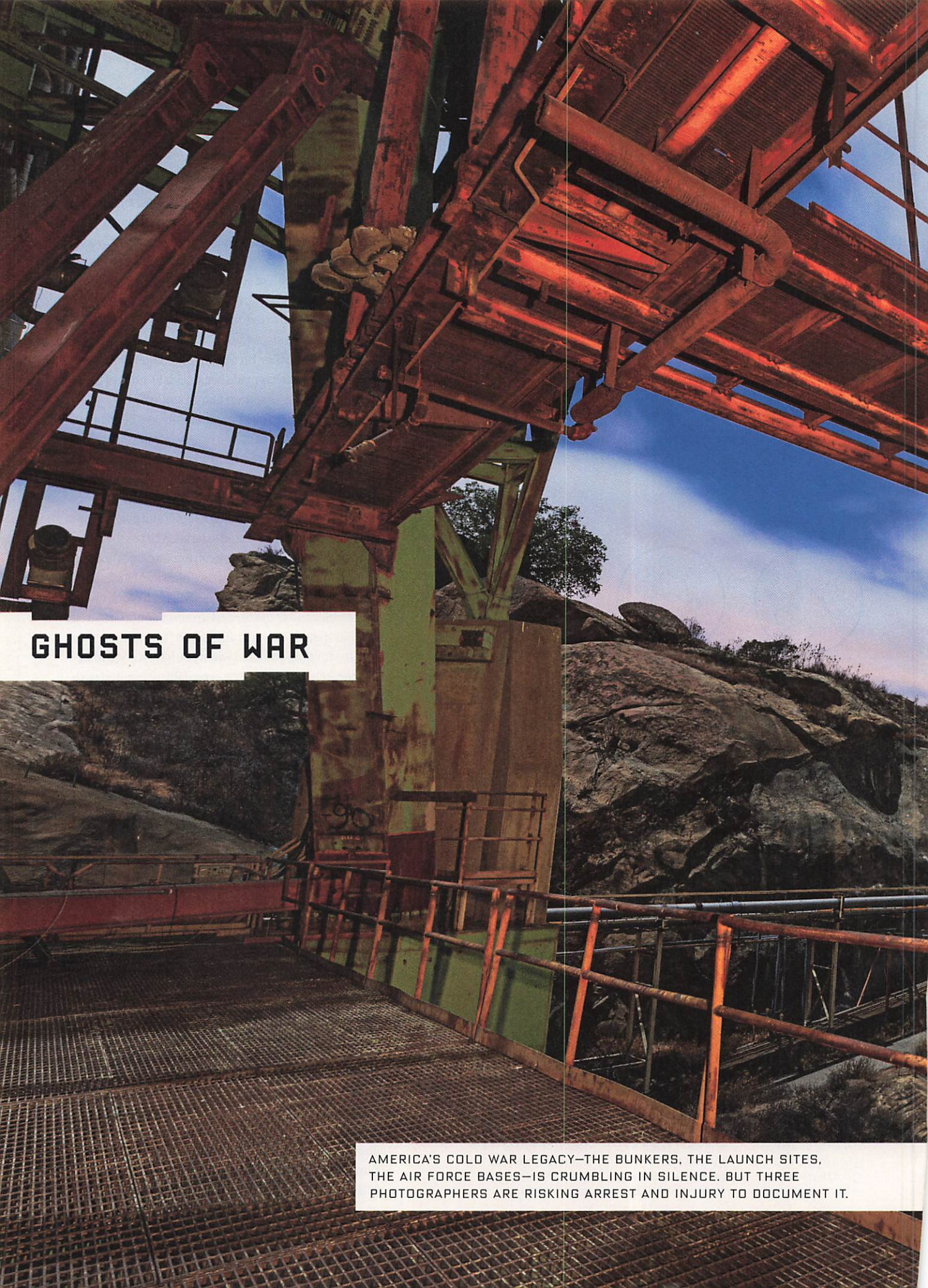
to sprout all over his body. His latest cycle of chemo, intended to shrink a tumor that is pressing against his brain, commenced soon after doctors sliced a big growth off his right leg; when Carson's nausea finally passes and he lies back down, his sweatpants ride up to reveal a canyonlike scar.

Olson is entirely calm as he prepares the boy for chemo, an attitude that never wavers during his harrowing daily rounds. A fourth grader who may not live to celebrate another birthday, a teenage girl whose gloomy prognosis has made her suicidal—none of these encounters erase Olson's tranquil smile.

That steady bedside manner has always been much appreciated by the families of Olson's patients, and they've long expressed their gratitude by supporting his research. Shortly after Olson founded his Fred Hutchinson lab in 2000, for example, a few parents banded together to host chili cook-offs and golf tournaments to raise money for staff salaries. And so when they heard that none of his chlorotoxin grants came through, parents upped their fundraising efforts. "I embraced their generosity," Olson says. He began to reach out to more families after the earliest group of donors assured him that they would go to any length "to make sure you have the funding you need when you have a good idea."

Olson's chlorotoxin pitch especially resonated with parents who had seen firsthand the limits of cancer surgery. Among them was Kris Forth, whose son, Brandon, had multiple surgeries to remove a tumor on his brain's fourth ventricle. "There was always a piece of the cancer left inside him," says Forth, who was by Brandon's bedside when he died in March 2010 at the age of 11. "If Tumor Paint had been available then, it probably would have changed the outcome." As part of her healing process, she opened a thrift store that has given tens of thousands of dollars to Olson's lab; an informational poster about Tumor Paint hangs by the shop's cash register.

The $5 million in crowdsourced donations that Olson eventually raised from thousands of donors was critical to his efforts to refine his cancer-seeking compound. After several years of fine-tuning, Tumor Paint started to show enough promise to attract funding from conventional channels. The National Cancer Institute chipped in a quarter-million dollars, a portion of which was used to launch a canine study at Washington State University; the veterinary surgeons there have been enthusiastic about the results. In 2010, Olson founded Blaze Bioscience, which has now raised $20 million, all through individuals. Blaze launched the first human clinical trial of Tumor Paint in December 2013; a second Phase I trial is slated to begin later this year. | CONTINUED ON PAGE 120



# GHOSTS OF WAR

AMERICA'S COLD WAR LEGACY—THE BUNKERS, THE LAUNCH SITES, THE AIR FORCE BASES—IS CRUMBLING IN SILENCE. BUT THREE PHOTOGRAPHERS ARE RISKING ARREST AND INJURY TO DOCUMENT IT.

BY JON LACKMAN

JON HAEBER, SCOTT HAEFNER + STEPHEN FRESKOS

## Santa Susana Field Laboratory

SIMI VALLEY, CALIFORNIA

The Army, the Air Force, and NASA tested ballistic-missile systems and spacecraft engines here from 1947 to 2006.

# IT'S NEARLY NIGHT-FALL AND SAGE RANCH PARK SEEMS DESERTED.

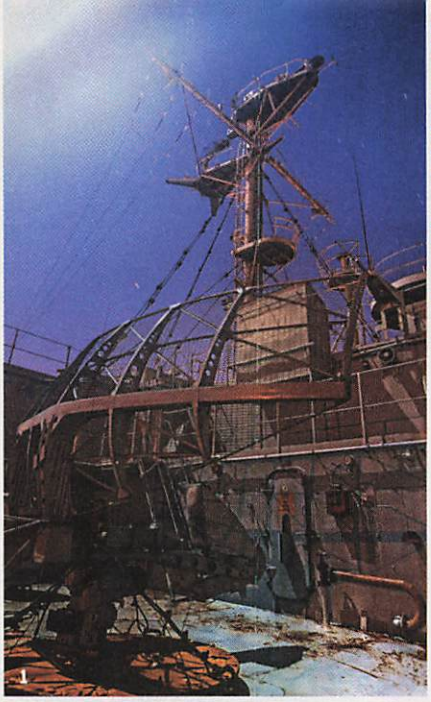
But just as we're about to stop the pickup, headlights pass: cop car.

"Black-and-white!" Stephen Freskos yells ruefully from the passenger seat. It's a bad omen for the plan that he and his two companions have made for their evening. They've chosen Sage Ranch, on the northwestern outskirts of Los Angeles County, as the departure point for an illegal infiltration into the Santa Susana Field Laboratory, a massive former military installation closed to public view. Their goal: to photograph the site before it, like much of America's hidden Cold War heritage, is demolished and swept away forever.

The three men—Freskos, a beefy construction manager; Scott Haefner, a wiry web developer with glasses, in the driver's seat; and Jon Haeber, the smallest of the three and a preservationist by trade, in the back—have spent years exploring deserted spaces together. They started with vacant movie theaters and bowling alleys, then moved on to bigger game: resort hotels, Michael Jackson's Neverland Ranch, a mansion belonging to Steve Jobs. Now in their thirties, they've made a special study of military installations, the documentation of which they feel to be an important public service. During the past half decade, the three have penetrated an astonishing range of secret places, from a Minuteman launch control facility in South Dakota to a Titan II missile site in Marana, Arizona; from the Naval Air Warfare Center in West Trenton, New Jersey,

**Suisun Bay Reserve Fleet**

**SUISUN BAY, CALIFORNIA**
The ships in this mothballed fleet were used in WWII, the Korean War, the Vietnam War, and Desert Storm.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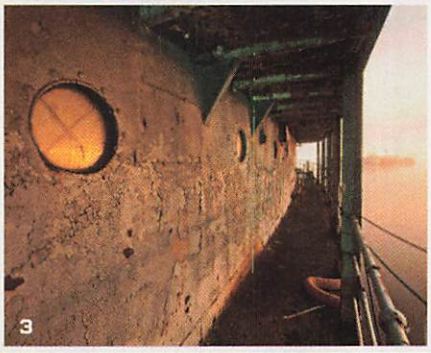
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1..... Crow's nest, USS *Point Defiance*
2..... USS *Sperry*
3..... USS *Taluga*
4..... The "shipboard forest"
5..... Lower berth on the USS *Glacier*
6..... Chalkboard in an engine room

▶

7..... Insignia on a diesel fuel tank
8..... Air shaft in a powerhouse
9..... Equipment terminal, level 4

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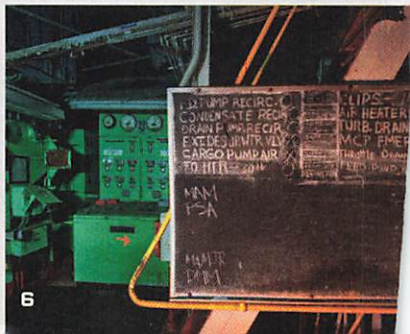
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to an Atlas E launch site outside Topeka, Kansas. In their home state of California, they've burrowed inside multiple former Air Force bases, four missile sites, and countless other forbidden military spots. This will be their eighth and likely final trip to Santa Susana, which tested ballistic-missile systems and spacecraft engines for the Army, the Air Force, and NASA from 1947 to 2006.

Over Freskos' objections, Haefner and Haeber insist on sticking to their plan. Yes, there are other places they could park the truck and hike in. But Sage Ranch, a popular destination for backpackers, will allow them to blend in even if they're seen with their gear. "Often, more important than not being seen," Haeber says, "is keeping people from looking *too hard* at you."

Once it's clear the cruiser is gone, Haefner doubles the truck back to his original spot. We tumble out and sling on backpacks full of food, water, and gear. The camera equipment alone—digital SLRs, lenses, lights, and tripods—works out to 20 pounds per person. Attire is dark clothes in layers: thermals, sweaters, down jackets, hats, gloves. We silence our cell phones and don industrial-strength headlamps, though we won't use them unless it's absolutely necessary. As always, the men have scheduled their expedition for the night of a full moon, to reduce the need for artificial lighting that might attract attention. (Photographs taken under the full moon can appear as brightly lit as daytime shots, given a sufficiently long exposure.)

The two-and-a half-mile hike takes us down a pitted trail with gorgeous but perilously distracting views: deep ravines, improbably large sandstone outcrops, vistas of Los Angeles, and a vast dome of sky. Coyotes howl, sometimes in the distance but at other times disconcertingly near. On a few occasions, a bump or crack sends us stooping for cover, but these prove to be false alarms. Halfway to our destination, we jog along the shoulder of a quarter-mile of road bookended by two sharp turns. Here cruisers can appear without notice, and there's no scrub to duck into—just dirt and barbed wire. Much of the land is permanently bare, a result of contamination. "If a car comes, just hit the deck," Freskos advises.

A great horned owl heaves off a power line, startling everyone. But no cars show. Off the road again, the trail forks several times, and for a moment we're lost. "We go through this every time!" Haefner whispers, exasperated. We wait while Haeber consults his phone. (It's perhaps fitting that the military trespasser's toolbox includes many items pioneered by the military, such as GPS and satellite imagery.) As soon as we crest the ridge ahead, we can see our first destination looming in the near distance: the Alfa test stands, which once flared as bright as the sun.

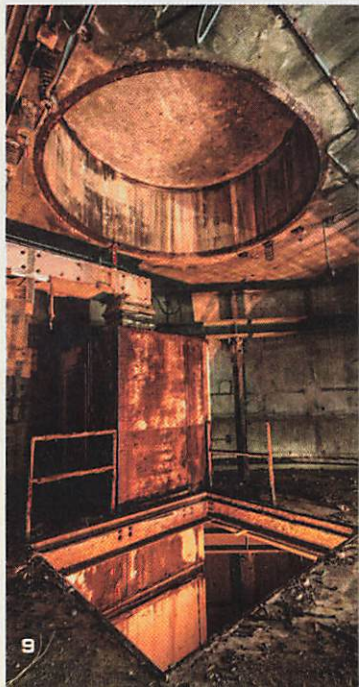
**JON LACKMAN** (jonlackman@gmail.com) *wrote about the Parisian urban-explorer group UX in issue 20.02.*



**THE SCALE OF AMERICA'S** Cold War expenditure dwarfed everything that came before it. In today's dollars, the Revolutionary War cost the country $2.5 billion, the Civil War $84 billion, the First World War $350 billion, the Second $4.3 trillion. During the Cold War, America's tab just for nuclear weapons ran to $5.5 trillion. Thanks to the Cold War, the US Department of Defense owns more building space—2.3 billion square feet—than any other entity in the world. (These holdings are roughly 40 years old, on average.)

Yet most of our Cold War matériel is nearly impossible to see. Civil War buffs can visit more than 200 forts and 100 battlefields; there are major national museums devoted to World Wars I and II in Kansas City and New Orleans, respectively, as well as the stunning Holocaust museum in Washington, DC. But the Cold War remains practically invisible. There are repurposed fallout shelters scattered across the country, small missile museums in California, Florida, Arizona, and South Dakota. A chunk of the Berlin Wall anchors a row of urinals in the men's room of a low-rent Las Vegas casino. Beyond that, there's not much else.

It's especially tragic that the Cold War enjoys so few monuments, because its physical legacy is the most monumental of all. Consider the Titan I missile complexes: Deployed in the 1960s, these 18 sites were masterpieces of engineering, awe-inspiring in their scale, testaments to the power of collective action on the order of the Egyptian pyramids. Each was the equivalent of an entire town built completely underground, with its own self-sufficient utility systems, designed to launch and withstand multimegaton nuclear bombs. Each required 32,000 cubic yards of concrete and 7,500 tons of steel. They included three enormous silos, a control center, and a powerhouse, all interconnected by a half-mile of tunnels and suspended on vast impact-absorbing spring beds. As military historian David Spires observes, missile propellant was pumped "at temperatures as high as 120 degrees Fahrenheit to as low as −400 degrees, through shock-resistant piping at various flow rates under 6,200 psi of pressure." Simply maintaining these complexes required procedure manuals that were hundreds of pages in length.




**Titan I Missile Site**

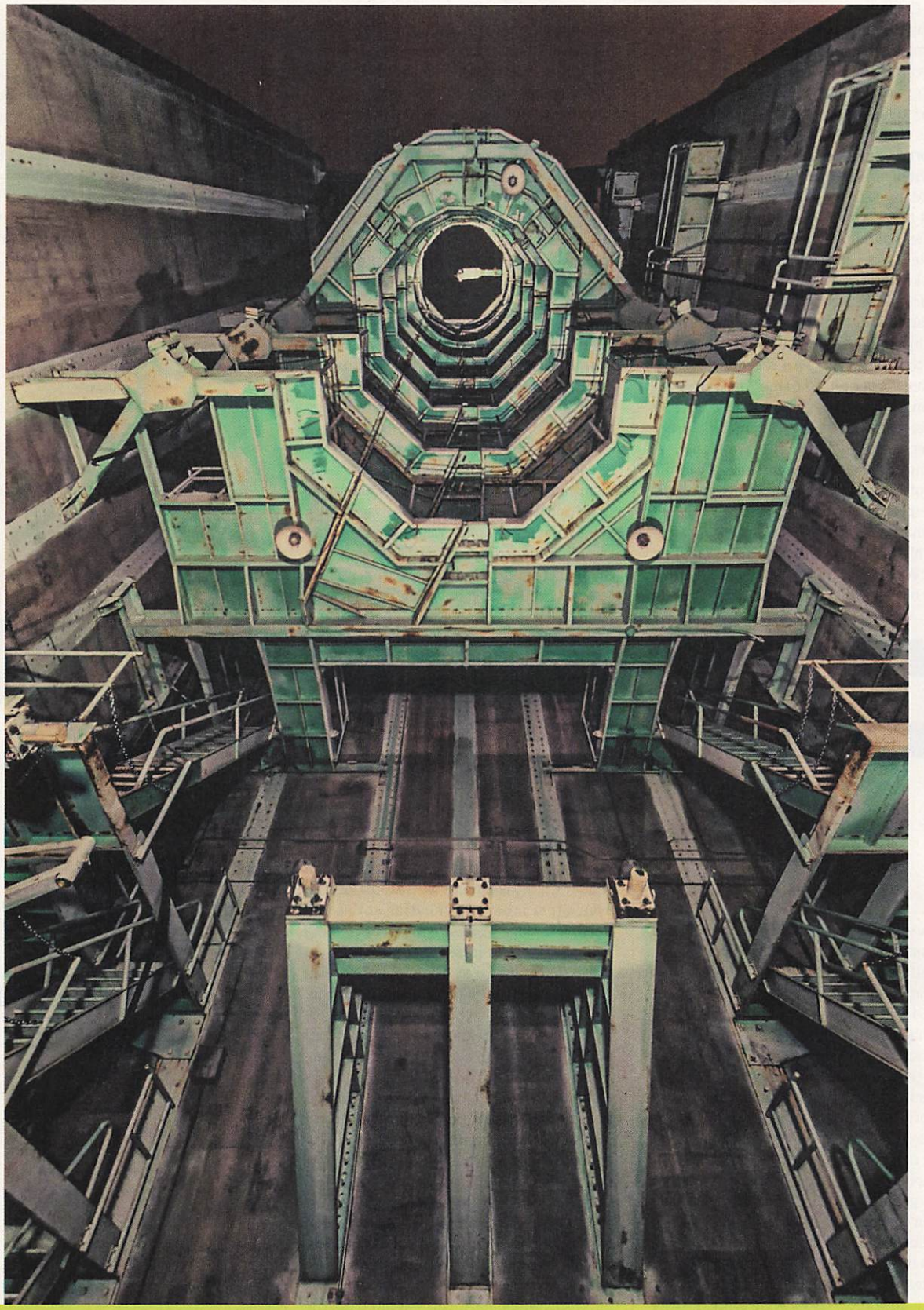
**YUBA CITY, CALIFORNIA**

One of dozens of missile complexes built in the 1960s, this site was designed to launch and withstand multimegaton nuclear bombs.

## Santa Susana Field Laboratory

**SIMI VALLEY, CALIFORNIA**

This stand was used to test the nuclear-tipped Atlas, America's first intercontinental ballistic missile.



**UTC Chemical Systems Division**

**SAN JOSE, CALIFORNIA**

United Technologies made rocket boosters for Titan launch vehicles, which deployed intelligence-gathering satellites.

The Cold War produced such modern wonders by the thousand. But our chances for even one real Cold War museum are remote. Hours after the USSR collapsed, conservatives proposed monuments to "America's victory over communism." However, their efforts crumbled because of a lack of public support, as the progressive historian Jon Wiener demonstrated in *How We Forgot the Cold War*. Many citizens, young people especially, doubt the war had a real winner. Gretchen Heefner, who teaches Cold War history at Northeastern University, says her students are "skeptical of American power and governance," influenced by their perception of the Iraq and Afghanistan wars as misguided.

At this point, Americans don't even know what the Cold War was. A recent *Newsweek* quiz asked people to name the war's target; only a fourth of respondents correctly answered communism. (Common incorrect answers included the Great Depression, slavery, and climate change.) It's a deeply ironic state of affairs, given that millions of Americans—perhaps even most Americans—could find amazing physical monuments to this chapter in history within an hour's drive. The only catch: We're not allowed to see them. And soon many of them will be gone.

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**FOR A VISCERAL APPRECIATION** of the Cold War's scale, you must stand before behemoths like Alfa Test Stand I, which rises into view soon after we cross into Santa Susana. Built in 1954 and designed to withstand the force expended by the thrust chambers of Atlases, America's first intercontinental ballistic missiles, the stand is an imposing tangle of steel rather like a blocky Eiffel Tower. It tapers to a platform 90 feet up, with the whole apparatus perched above a mammoth exhaust chute.

The moon is shrouded in cloud, so the photographers decide to try starting out in Alfa's underground control room. Last time they couldn't get in, because it was chained up with a padlock; it would have been short work to break it, but they worried about noise, and besides, they operate by the hiker's ethic of "leave no trace." (It's a wise ethic, legally speaking, since forced entry or lock-pick possession would convert misdemeanor trespassing into a felony.) As we look around, Freskos notices new portable toilets and caution tape nearby—signs that contractors have been working here recently, which is promising news. We descend some stairs, and sure enough, we find another control-room door that isn't locked. It's not even shut.

We dead-bolt the door behind us, locking ourselves inside a room that, in both size and decor, roughly approximates an insurance branch office from the 1960s. It feels lived in, as if it had been abandoned just yesterday. Soft-drink cans and business cards are still strewn across the desks, and the place reeks with a sort of industrial must. It's easy to imagine it full of crew-cut men in short-sleeved shirts and blocky eyewear. For the first time, I truly feel like a trespasser. Haeber, the preservationist, loves this feeling the most—the sense that he's seeing how the Cold War looked to the men on the ground, the ones who did the drudge work to realize the ambitions of generals and politicians.

All three men set to work with their cameras. Shooting the control panel is a particular technical challenge; the room's lights no longer work, and the panel's reflective surface makes standard photographer's rigs a challenge. So they illuminate the scene through what they call "light painting": leaving their camera shutters open while sweeping flashlights of varying color and intensity over the panel, a bewildering 20-foot-wide array of bristling analog switches. This single shot takes the men more than an hour to refine; they keep accidentally overexposing one section of the panel such that it shows up as a white glare, like a side-view mirror reflecting the sun. "Are we overthinking this?" Haefner asks repeatedly.

The shot finally accomplished, we come back outside to find the moon still hidden behind clouds. Haefner checks his weather app, which promises clear sky an hour from now. "It just needs to get a little colder," Haeber says, proposing that we walk to Coca, an even larger missile installation at the site. Getting to Coca from Alfa involves walking along a slick mile-long water pipe; in some places it's as slender as 18 inches in diameter, as high as 30 feet off the ground. Balancing on it isn't difficult technically, but it's nevertheless a mental challenge—start to worry and you'll find yourself wobbling. In the end, I'm the only one to fall: When the pipe gets closer to the ground, I celebrate too soon and slip, crashing down onto the cold metal—but luckily not to the hard earth below.

Along the way, we pass 12 massive water towers, which hold up to a million gallons each. During missile tests, nozzles surrounding the stands sprayed continuously, mostly to cool the equipment and guard against fire. Soon we reach Coca's two stands, 160-foot-high colossi whose size rivals even the surrounding rock outcrops. Huge platforms extend from the stands like diving boards. "That would be a fun one to rappel off of," Haeber muses. (Past expeditions have required them to learn technical climbing | CONTINUED ON PAGE 122

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1. Access tube to an Atlas silo
2. Launch control switchboard
3. Liquid oxygen tanks
4. Blast lock area
5. Spiral staircase up to the surface
6. Ventilation control panel
7. Relics from a Titan silo
8. Launch crib for a ballistic missile
9. Tube to a Titan test facility
10. Access tube to two more silos
11. Algae blooms in a destroyed silo

**Getting to one test stand involves walking along a slick mile-long water pipe as high as 30 feet off the ground.**

# Vandenberg Air Force Base

**VANDENBERG, CALIFORNIA**

This base served as the launch site for the Corona project, America's first satellite surveillance effort, which covered more than 1.65 million square miles of Soviet territory in 1960.

APIOS AMERICANA
Potato Bean

Foragers can find the potato bean growing in bogs and on riverbanks throughout the eastern US.
Finicky flowers make artificial insemination nearly impossible, so scientists rely on insects to do the pollinating.
The plant fertilizes the surrounding soil by capturing nitrogen in the atmosphere, which bacteria on the roots then convert to ammonia.

OKSANA BADRAK

**HOW OVERLOOKED PLANTS LIKE THE POTATO BEAN CAN BE TAMED TO FEED THE WORLD.**

# The Wild Bunch

BY **HILLARY ROSNER**

GENTL & HYERS

A HAND-PAINTED WOODEN sign marks the entrance to Steven Cannon's community garden, tucked between a sidewalk and some train tracks in Ames, Iowa. It depicts the iconic image of a seedling poking from a mound of dirt. At the far end of the garden, Cannon, a tall and reedy geneticist for the US Department of Agriculture, digs into the soil with a shovel and then his bare hands, pulling up fistfuls of lumpy roots. Strip the scene to its essence—ignore the cars driving past and the power lines strung overhead—and you could be watching a Neolithic farmer. They collected seeds from wild plants, buried them near their homes, and harvested the crop, hoping it would be bigger and better than the last one. That simple act—agriculture—came to define us as a species.

Cannon isn't trying to re-create the past, though. He's inventing the future. On this fall afternoon, his team is harvesting tubers that resemble dark-skinned fingerling potatoes. They're called *Apios americana*, the potato bean—a legume endemic to North America. Native Americans gathered them and may even have served them at the first Thanksgiving. European settlers found them thriving in their cranberry bogs—places with low light, few nutrients, and bad soil. But they didn't bother domesticating them into an agricultural staple.

After a couple hours of labor, Cannon's harvest is complete. A dozen rubber bowls overflow with dirt-crusted tubers. Still, he is disappointed. "We were hoping for a little better yield," he says. "This is about average." Average is fine if you're just messing around in a kitchen garden. But Cannon is up to something far more essential. The potato bean is part of his plan for remaking our food supply from the ground up. He doesn't want to just grow *Apios*. He wants to turn it into a new crop that could help feed the world.

**HILLARY ROSNER** (mail@hillaryr.net) *wrote about mutant pupfish in issue 20.12.*

## Recipes for Tomorrow

### MASHED POTATO BEANS

**YIELD:** 6 servings

**INGREDIENTS:**

- **2 LBS** ... potato bean tubers
- **1 C** ..... half-and-half or milk
- **8 TBS** ... unsalted butter (Potato beans, which have three times the protein of their namesake starches, might be a little dry, so this recipe compensates with extra fat.)
- **6 TBS** ... soft goat cheese
- **¼ TSP**... freshly ground black pepper
- **¼ TSP**... freshly ground nutmeg
- salt to taste

**PREP:**

Peel tubers, then boil until soft, about 10 to 15 minutes. Drain and mash. Add half-and-half or milk. Mix in butter and then pepper, nutmeg, and salt. Serve topped with goat cheese.

We need new crops. Thousands of years of breeding and decades of genetic modification have made the crops we sow predictable, easy to harvest, and capable of feeding more than 9 billion people. But they are also vulnerable to disease, pests, and the whims of weather. That's troubling, because global warming is bringing more disease, more pests, and more whimsical weather. On current trend lines, global wheat and soybean harvest yields could fall by nearly 30 percent by midcentury. Corn yields could drop by 7.5 percent. In the baking-hot European summer of 2003, plant growth fell by 30 percent. By 2050, that kind of summer will be the new normal. "Suppose the US breadbasket ends up with a climate like Texas," Cannon said at a genetics meeting last year. "We need to look to species already adapted to extremes."

The potato bean is one of those species. Versatile like a potato, protein-rich like a bean, with a flavor vaguely like a starchy peanut, *Apios* does well in both dry and soggy soils. And there are plenty of others like it. Roughly 18,000 species of legumes grow around the world. They're packed with protein and help fertilize the soil. Yet people have domesticated fewer than 50, and commonly eat only half that many. Cannon has assembled a short list of additional candidates: marama beans, yehub nuts, lupine, and a bunch of other so-called orphan crops, wild edible plants that could change the face of agriculture if someone could just turn them into reliable crops.

Domestication made humans the first species on earth to have a secure, reliable food supply, enabling the development of culture and technology and medicine. Every facet of modern society is built on its back. Yet somewhere along the way, we stopped innovating. Cannon is one of a small but committed band of researchers who are quietly trying to create new crops. They're messing with new versions of wild sunflowers that have bigger, oilier seeds and don't need as much water. They're working on a genetic rewrite of the chickpea, selecting traits that will help it thrive in a warming world.

Climate change is making the mission imperative; the genetic revolution is making it feasible. That harvest from Cannon's neighborhood garden might have been disappointing, but it was also the first shot in the next green revolution.

FOOD STYLING BY REBECCA JURKEVICH; PROP STYLING BY CHAUNTE VAUGHN

DOMESTICATION IS evolution—with human beings at the controls. When nature is in charge, evolution selects living things based on traits that favor their survival; we humans select instead for traits that promote yield, flavor, predictable growth, and resistance to attack. We started doing it mainly because we could. In the Paleolithic era, fluctuations in climate made it hard for groups of humans to rely too heavily on particular plants. But when the climate stabilized after the last ice age, around 12,000 years ago, we could pick and choose. Around the world, farming impulses stirred in different societies. People from divergent cultures began actively managing many of the same wild plants during the same period. From the several thousand plant species that prehistoric people regularly relied on for food (out of roughly 50,000 species that are edible), our ancestors chose just a handful, all grasses, to form the bedrock of their diets.

Those domesticated organisms often bear little resemblance to their wild ancestors. Ten thousand years ago in what's now Mexico, for instance, farmers took a weed called teosinte and created corn. Teosinte's tiny ears contain only about a dozen kernels; an ear of modern-day maize has about 800. Selective breeding turned a scruffy grass into a starch-packed staple of the global meal.

**It sounds simple, but humans haven't domesticated a new staple crop for thousands of years.**

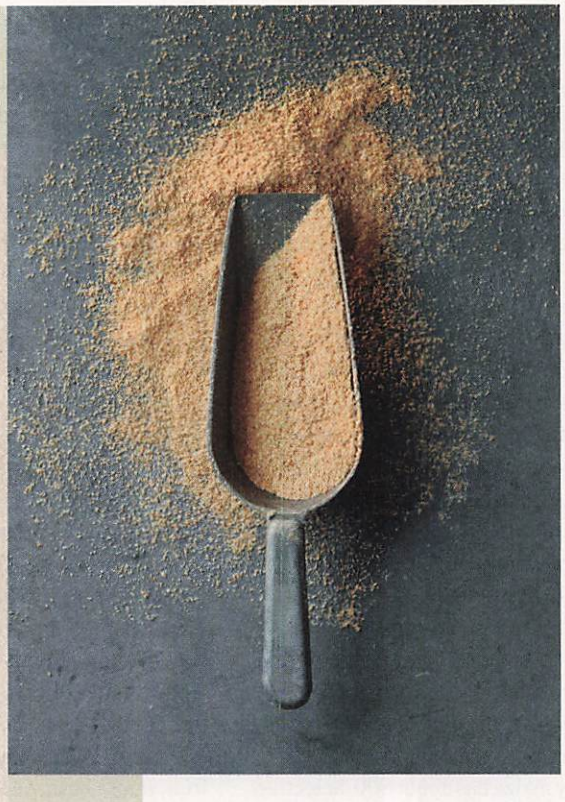
What domesticated food crops do look like, however, is each other. Many of the traits we humans selected are the same regardless of the species. We want plants that hold on to their seeds rather than drop them to the ground, which plant scientists call "shattering." We want those seeds to be large and to sprout when sown, and we want all the seeds to mature at roughly the same time. Together, these features make up what scientists call "domestication syndrome," the combined qualities that distinguish, say, corn from teosinte.

Much of what we eat today was domesticated when people were just learning to weave clothing and still thousands of years from developing an alphabet. Today we tinker—but only at the margins. Maybe we get higher yield here or resistance to corporate herbicide over there. As far as transforming plants from the wild into new well-bred row crops, though, progress pretty well stopped a millennium before Jesus ate a matzo. Macadamia nuts, kiwifruit, vanilla bean: All arose in the Common Era. But as far as major crops go? Zilch.

Today, humans rely on fewer than 150 plants for nourishment, and just three cereal crops—wheat, rice, and corn—make up more than two-thirds of the world's calories; along with barley, they own three-quarters of the global grain market. Those crops, by and large, aren't suited to a changing world. Modern humans have a chance—an imperative, even—to do it better. That's the appeal of domesticating a whole new set of plants. It's a back-to-our-roots undertaking that goes way beyond seed-saving hippies or even postapocalyptic seed banks like the vault in Svalbard. "There's something quite romantic that does appeal both to the foodies and the biotech crowd," says Susan McCouch, a plant geneticist at Cornell University. "It's ancestral, and also critical for the future."

TAKING PLANTS FROM the wild and bending them to our will is a painstaking process. But a geneticist named Lee DeHaan already has results to show—and taste. That's because today's domesticators have tools our ancestors never could have conceived of: DNA sequencing technology allows researchers to choose exactly what traits they want—guiding evolution in a fraction of the time it took our Neolithic predecessors.

Kernza copes well with climate change. While increasingly erratic rainfall has hurt crop yields in recent years, the water-efficient perennial delivers reliable harvests.
"Intermediate wheatgrass" is not a marketer's dream, so the grain was renamed Kernza, a portmanteau of the words kernel and Kanza, a tribe native to the US heartland, where the grain is being developed.
Thanks to the falling costs of genomics technology, researchers believe they'll breed a market-ready version of this hearty grain within the next 20 years.
Unlike the shallow root systems of conventional wheat, Kernza puts down roots as deep as 10 feet, allowing the plant to tap water and nutrients that might otherwise go to weeds.



THINOPYRUM INTERMEDIUM

## Kernza

On a warm day in January, DeHaan rummages around in a freezer at the Land Institute, an agricultural research lab in Salina, Kansas, and digs out a loaf of bread for me. It's sheathed in brown paper and entombed in a ziplock. I tuck it gently into my bag like something precious, because this isn't any old frozen provision. It was made with a grain that DeHaan invented. It's derived from a distant uncle of wheat called intermediate wheatgrass. Modern wheat is an annual, a plant that farmers have to sow anew every year, but DeHaan's grain is a perennial. It lives through multiple growing seasons, which means it requires less fertilizer (which in turn means a reduction in toxic runoff). Our prehistoric ancestors turned to annuals because they typically produce more seed and do well in disturbed soils, and their need for replanting from seed each year made them easier to domesticate in the first place. But perennials don't waste energy putting down new roots each year, which also means farmers don't have to expend energy breaking up topsoil.

Perennial grasses dominated the famed prairie ecosystem that once spread across

Kansas. The plants, deep-rooted and tall, resisted disease and grew in thick mats that left no room for weeds. They lock carbon in the soil and are better at coping with erratic rainfall (again: climate change). Yet today, acre upon acre of former grassland in North America is planted instead with namby-pamby, needy annuals: wheat, corn, soybeans. The same goes for China, Brazil, and Russia.

Back in 1976, the Land Institute set out to reengineer existing grain crops into perennials. They started by crossbreeding conventional annual wheat with intermediate wheatgrass. It worked, but only sporadically. Then, in 2001, DeHaan showed up. He grew up on a farm in Minnesota, and he had wanted to tinker with perennial grain ever since he was a kid. (Some boys dream of driving tractors, others of creating new plants by meticulously transferring motes of pollen.) He began by working on the wheat crosses, but on the side he started from scratch, selectively breeding the wheatgrass.

Initially, DeHaan thought a perennial wheatlike grain would take 50 to 100 years of artificial selection. But as genomic technology has become faster and cheaper, the work has accelerated. Breeders sequence the DNA of seeds and then use genetic markers to select plants with the traits they want. Genes that confer low shattering in corn will likely do the same thing in wheat, or potato bean. The method is still traditional breeding—not genetic modification—but the DNA code opens a shortcut.

By 2010, what DeHaan's team had was brand-new and very wheatlike—except in the roots. Wheat roots are thin and extend down just a couple of feet; the new crop sat atop a huge root system extending 10 feet down, tapping water deep underground and effectively stealing it from weeds. The deep roots are also better at absorbing soil nutrients that might otherwise be completely lost.

The institute named the new plant Kernza, a nod both to kernels and to Kanza, the native tribes of the region and the etymological root of Kansas. "We don't want a niche market that succeeds economically," DeHaan says. "We want something that changes agriculture in a significant way." Kernza looked to be it.

Kernza has since attracted a growing band of collaborators, from universities (University of Kansas, University of Georgia, Kansas State, University of Minnesota) to the federal government (the USDA) to big corporations (General Mills). Lately, the World Bank and the Gates Foundation have both come calling. And this summer, 90 acres of Kernza planted in Minnesota will be harvested for Patagonia Provisions, the outdoor-clothing company's fledgling line of sustainable foods. A distillery in Ventura, California, and a brewery in Lawrence, Kansas, are also experimenting with the stuff.

Still, Kernza isn't ready to upend agriculture yet. The seeds are too small and the yield too low; it shatters, and the hulls stick to the seed, impeding milling. "Those are major barriers," DeHaan says. He estimates it'll take 20 years to get it perfected. Not bad, considering that it took between 2,000 and 4,000 years to domesticate wheat, rice, and barley.

**Climate change is making the mission imperative; the genetic revolution is making it feasible.**

The bread DeHaan gave me, made from Kernza, defrosts in my car on the drive home to Colorado, and even before I unpack I take the loaf into my kitchen, slice it into thick slabs, and eat it with butter. Despite having spent several months in the freezer, it is some of the tastiest bread I've ever eaten, with a rich, earthy flavor reminiscent of rye or pumpernickel but with the lighter texture of a peasant loaf.

DeHaan also gave me a bag of Kernza flour from a shelf in the institute's underground, concrete-walled seed vault. Inspired by the bread, I bake some chocolate chip cookies with it, using half Kernza and half standard all-purpose flour, roughly following a recipe developed by a Kansan named Elizabeth Peuchen. The verdict from friends and family: thumbs up. The cookies have a slightly nutty flavor, a complexity similar to whole wheat but without its unpleasant chewy quality. Eating them feels satisfyingly subversive, like I baked the future of the world's food supply into a sugary treat.

**WHEN EUROPEAN SETTLERS** came to North America, they looked out on a vast, edible landscape ... and mostly ignored it, passing over the potato bean, mesquite, and yucca fruits for the seeds they brought from home. Those settlers knew that their seeds would deliver reliable nutrition, and domestication is, frankly, hard work. Almost none of the crops we eat in this country originated here. Most of the New World foods—corn, tomatoes, potatoes, beans—came from what's now Central and South America. Even the few native crops that were arguably domesticated—a handful of fruits and nuts like blueberries, cranberries, and pecans—were probably spread naturally by birds and squirrels, not actively cultivated by humans.

These days, people are much more likely to go "food prospecting," grabbing what their neighbors have domesticated—garlic, cashews, quinoa, mango—and planting it themselves. It's what Timothy Crews, director of research at the Land Institute, calls a food slump. "We've been satisfied with increasing our diet with everybody else's foods," he says. That's a bummer, because local plants are the ones most likely to be adapted to local conditions.

The potato bean is a prime example. A scientist in Louisiana named Bill Blackmon spent the 1980s collecting and breeding it, assessing the features of more than 2,000 varieties. (This one grew quickly; this one had tiny tubers; this one tasted too much like dirt.) Cannon took the most promising 50 of those strains, plus a few that he and his team collected around the Northeast, and began training the weed to act like a crop.

Breeding legumes generally involves collecting pollen from male flowers with tweezers and a magnifying glass and moving it, by hand, to the females. Potato beans don't tolerate the process particularly well. "It's a complicated, almost orchidlike little flower," Cannon says. The various pollination-related parts are hidden and uncooperative, and the pollen is only viable for a few hours a day. So Cannon is relying on the kindness of passing insects to pollinate pairs of selected varieties that are grown apart from all the other plants.

The best strains of Cannon's potato bean currently yield about half as many tubers as a potato plant. But *Apios americana* has three times as much protein as a potato of the same weight, making it much more nutritionally efficient. Still, as Cannon puts it, at this point *Apios* "isn't as nicely behaved as a potato or a sweet potato."

Harvesting is also a challenge. Potato beans grow on long underground stems, called stolons, that require a lot of digging. "It is a vigorous vine, so it's not just going to stand up nice for a harvester," Cannon says. Domestication of the regular old potato involved selecting for dwarf varieties, with shorter stolons. But more recently scientists have identified the genes that control dwarfing in other crops, like beans and wine grapes. With that information, Cannon is trying to turn off the right genes in *Apios* in the hope of dwarfing it. He thinks it will take him a few more years.

So the work continues. With each harvest, Cannon's team measures things like the ratio of aboveground material (the vines and leaves) to the underground tubers, the number of tubers, and how far apart they grow from one another (tighter-spaced tubers are easier to harvest). They sequence the DNA of plants from each line, looking for genetic markers to make the selection easier. "In major crops like corn or soybeans, tens of thousands of varieties—with known and described characteristics—are stored and available to breeders," says Cannon. "For a 'new' crop like *Apios*, we need to start from zero." And then they eat their research.

One afternoon, on the long wooden table in Cannon's kitchen, atop quilted white place mats adorned with pictures of apples, pears, and other fruit, Cannon lays out an *Apios* feast—bowls of leek and potato-bean soup, plates piled with boiled and smashed potato beans topped with olive oil and sheep cheese, and a South Indian–type dish of potato beans simmered with mustard and cumin seeds, cashews, turmeric, coconut, and chilis.

The dishes are far more flavor-packed than their equivalent standard potato versions. The soup is vaguely nutty, and the mashed beans are more satisfying, like something nutritious rather than a buttery pile of starch. The Indian dish is rich and substantial without being overly filling. In all its presentations, the potato bean has a distinct legume quality, almost as if you'd crossed a lentil with a Yukon gold.

Those poor European settlers had no idea what they were missing. Sitting in Cannon's airy kitchen, I feel like I've been given a peek at an alternate reality. It's corny, I know, but those potato beans give off a faint aroma of nostalgia, a lingering hint of a lost parallel course for American agriculture. It's so close you can almost taste it.

A few miles away, in a glass-door fridge near Cannon's office at Iowa State, several dozen plastic bags crammed with potato beans wait on shelves. They are last year's harvest, measured and sequenced and ready to be roasted, fried, and sautéed. Someday they might be as unremarkable as sacks of potatoes. W

## Recipes for Tomorrow

### CHOCOLATE CHIP KERNZA COOKIES

**YIELD:** about 60 cookies

**INGREDIENTS:**

- 1½ C .... Kernza flour
- 1 C ..... all-purpose flour (Scientists are still tweaking Kernza's gluten levels. Since gluten provides elasticity, mix Kernza with wheat flour to keep things chewy.)
- 2 ..... eggs
- 1 C ..... butter, softened
- 1 C ..... brown sugar, packed
- ½ C ..... granulated sugar
- ½ TSP ... baking soda
- 1 TSP .... vanilla extract
- 12 OZ ... semisweet chocolate chips
- 1 C ..... chopped walnuts, pecans, or hazelnuts (optional)

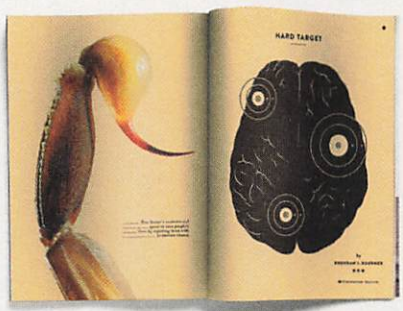
**PREP:**

Preheat oven to 375° F.

... In a large bowl, beat butter with electric mixer on medium to high for 30 seconds. Add sugars and baking soda. Beat until combined, scraping sides of bowl. Beat in eggs and vanilla.

... Beat in flour. Fold in the chocolate chips and nuts.

... Drop dough in rounded teaspoons onto ungreased cookie sheets, about 2 inches apart. Bake 8 minutes or until the edges are lightly browned. Transfer to wire rack to cool.




## Hard Target

CONTINUED FROM PAGE 103

**OLSON FIRST SHOWED ME** his one and only tattoo just days after he'd gotten it etched into his left shoulder. We were at the modernist lakeside home of his friend Anne Croco, an interior designer who is a key supporter of Olson's lab. The two were discussing plans for a fund-raiser, to which Croco wanted to invite Pearl Jam guitarist Stone Gossard, one of her many friends from what she terms "the small fishing village of Seattle." The talk of rock and roll spurred Olson to roll up the sleeve on his black T-shirt to reveal the fresh ink: a vaguely Celtic design that resembles a series of curvaceous uppercase As linked together. The tattoo represents the disulfide bonds that form a knot at the center of the chlorotoxin molecule.

Olson's tattoo is a tribute to not only chlorotoxin but also a range of similar peptides that he's now investigating as possible weapons against cancer and other diseases. Using a custom-written Python program that can troll through decades' worth of genomic databases on venoms, his lab has identified hundreds of thousands of molecules that share chlorotoxin's central knot of disulfide bonds and thus may form the basis for new cancer-fighting drugs.

To fund this research, Olson is expanding upon the crowdfunding techniques that were so vital to Tumor Paint's growth. His website for Project Violet offers a range of rewards for different contribution levels, much like on Kickstarter. For $100, donors can "adopt a drug candidate" and then track its progress; for $25,000 they can have dinner with Olson.

But conjuring a drug to life is a more complex process than, say, recording an album. The vast majority of pharmaceutical concepts that seem brilliant on paper end up leading nowhere, even after years of toil. When the stakes are so high, crowdfunding becomes much more complicated—especially when the one raising the money is also the funder's doctor. "When we're talking about a bedside physician versus a bench scientist, we're talking about physicians who have deep levels of trust with patients," says Josh Perry, an assistant professor at Indiana University's Kelley School of Business who specializes in the ethics of health care. As a model for other doctors, he warns, this kind of setup could be problematic. "They are basically trading on the depth of that relationship. It can be done, but I think it's delicate."

Perry also worries that physicians may be prone to overstate an innovation's promise—not because they're dishonest but rather because they care so much about their patients. "Even a physician with the greatest of intentions can become very emotionally invested in the success of their research," he says. "There's just lots of potential for compromised judgment on all sides."

Tumor Paint is a perfect example of an innovation that has received disproportionate attention because of a doctor's passion. The compound still has another two phases of clinical trials to complete to prove its safety and efficacy to federal regulators. But during Olson's stirring onstage performances, it can be easy to forget that so many hurdles remain. Even some people who believe in the promise of Tumor Paint worry that Olson's compelling pitch obscures the long journey ahead—including Patrik Gabikian, the former resident who first brought chlorotoxin to Olson's attention. "I'm not going to mince any words—as a person who takes care of patients with serious diseases, I don't like to believe in a lot of hype," says Gabikian, now a neurosurgeon at Kaiser Permanente Los Angeles Medical Center. While he understands that a certain amount of promotion is necessary to bring a new technology to market, he worries that Olson's knack for storytelling will give "undue hope" to people suffering from cancer.

Olson quickly brushes off such criticisms. "Patient-based funding is a huge part of what drives biomedical research. Often it's done indirectly—through foundations that offer grants," Olson says. "We tell the families about our failures as well as success and are completely transparent about spinouts and such."

Though accepting money from patient families may make ethicists squeamish, traditional methods of funding have their own problems—a fact well illustrated by the challenges faced by TransMolecular, the company developing chlorotoxin as a treatment for gliomas. Despite all the initial fanfare, TransMolecular couldn't publish the results of its Phase II trials when they were finally ready. Sontheimer blames this failure on the 2008 economic crisis, which caused venture capitalists to grow leery of backing biotech companies with idiosyncratic products. TransMolecular's CEO died unexpectedly the following year, and his successor decided that the best course of action was to liquidate. Sontheimer still holds out hope that the company that purchased TransMolecular's assets will eventually continue his work.

If a little old-fashioned salesmanship can help Tumor Paint avoid these kinds of bureaucratic pitfalls, Olson is willing to endure whatever criticism comes his way. Perhaps the ethical purists might feel rather differently if they, like him, had to walk around a pediatric cancer ward every day. W


# COLOPHON

**TRESPASSING THAT HELPED GET THIS ISSUE OUT:**

#whatjayzsaidtosolange; coming within inches of a rattlesnake in Sedona, Arizona; Childe Fergus' predawn shuffle down the hall to awaken grumpy parents; snagging a "reserved" table in the Condé Nast cafeteria; WIRED women invade Wikia's bathroom; dancing atop a church parking lot welcome sign; an illicit moonlight swim in Hawaii; stepping in and out of Super Duper Burger just for the air conditioning; mouse: 2, human: 0; visiting the office construction zone; sure, I'll buy a coffee if you let me use your bathroom—psych!

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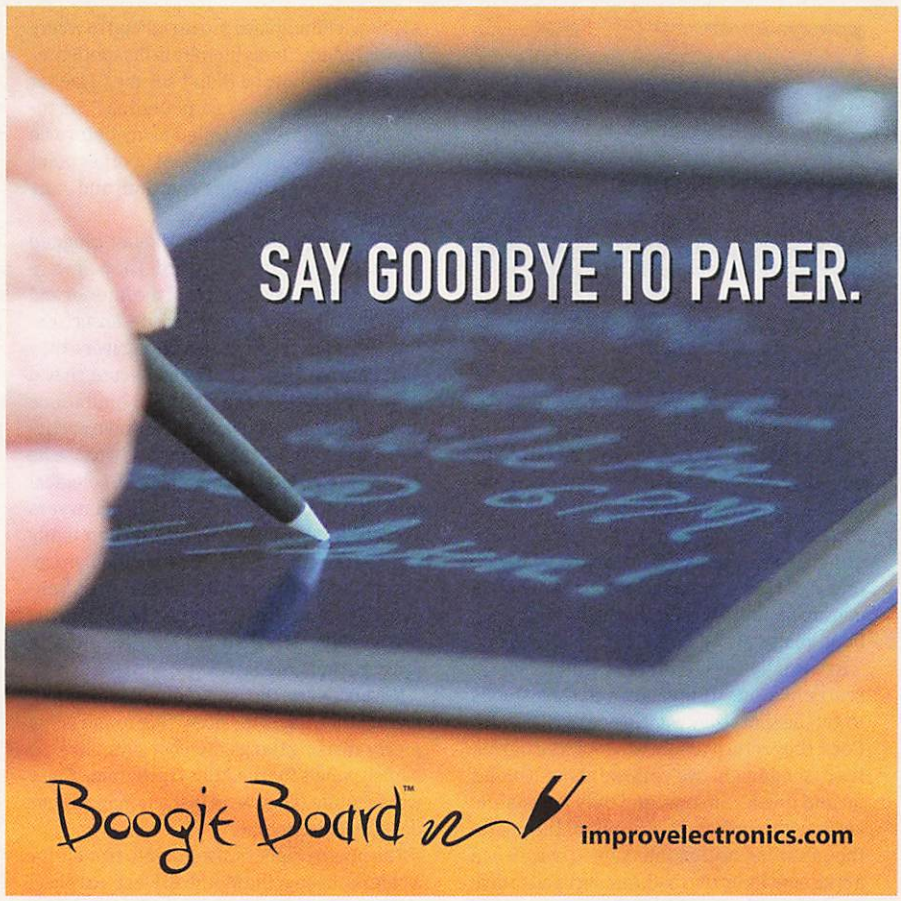

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## Ghosts of War

CONTINUED FROM PAGE 110

skills.) The tail chute, where the flames came out, gapes as if frozen in an eternal scream. "It's so quiet here now, but when this place was going, it was so loud," Haefner says. In a reminiscence published in an official history, one observer remembered the report of an engine test as "exceeding the loudest rock band you've ever heard."

Eventually the clouds part, and the three scurry like ants up and down the test stands to get the shots they want. Once finished with Coca, they return to Alfa to shoot its exterior. It's past midnight, we've hiked about 10 miles up and down canyons, and only adrenaline keeps us on our feet. They begin another marathon shooting session, interrupted twice when a cruiser pulls up the road, forcing us all to dive out of sight. The second time this happens, I end up pinned behind a wall, inches from the road. Forced to sit still, I can't help but fall fast asleep.

**HAEBER, HAEFNER, AND FRESKOS** have made more than a thousand site visits in all. They've been caught a handful of times but have always escaped conviction. One of their closest calls came at the Port of Los Angeles, when cops found Haefner exploring a former coal-export terminal. He was cuffed, pushed down into a police cruiser, and interrogated for three hours. Afterward he was issued a citation and even assigned a court date. But the night before court, he phoned the assistant DA, groveled like mad, and got the charges dropped.

Without a doubt, their most foolhardy expedition has been the one inside Vandenberg Air Force Base, the only active site they've infiltrated. When Haeber first proposed it, Freskos called the idea "beyond stupid" and refused to go. The base literally has missiles ready to be equipped with nuclear warheads and is guarded under high security. But for missile-testing aficionados, Vandenberg is the equivalent of Disneyland: Thor, Atlas, Titan, Minuteman, Peacekeeper, and Interceptor missiles all have been tested there. When Haefner and Haeber started to consider the idea, they subdivided the infiltration into a series of small steps, each of which they realized was feasible; at that point, they felt they had no choice but to try. It nearly ended in disaster. Haeber suspects that he tripped a sensor; an AR-15-wielding guard drove right up to where he was hiding. "I was literally in his spotlights. I don't know how he didn't see me," Haeber says. "My heart was just pounding." Fortunately the guard got called away before he could get out to investigate. At another point they had to hop a bridge guardrail and cling to a pipe while a car passed.

Things got scarier when Haeber blogged about the adventure afterward. The pair were pursued by the Department of the Interior and the FBI, whose investigators tried—unsuccessfully—to trick them into admitting *when* they had infiltrated the base. (To prosecute, they'd need to prove that the statute of limitations hadn't elapsed.) The Feds came down particularly hard on Haefner, probably because he works for a federal agency, the US Geological Survey. He and Haeber had to hire lawyers at considerable expense and got thoroughly freaked out. Eventually they avoided prosecution but were formally banned from Vandenberg. "Your presence is detrimental to the maintenance of good order and discipline," a letter to them read.

Nevertheless, they now count Vandenberg among their favorite sites. "We found some pretty amazing things," Haeber says, "like the launch panels for the Atlas D program. These were mobile. They were just as small as your desktop fax machine."

The photographers also got into trouble for a blog post about the Mothball Fleet—a collection of retired Navy vessels docked in Suisun Bay, California, which the three infiltrated and photographed over several weekends. (To get there, they inflated a raft, hid in a cove while waiting for security boats to pass, and then listened for encrypted Coast Guard codes on a scanner to elude the regular patrols.) After Haeber recounted this story online, investigators from the Department of Transportation visited Freskos at his workplace, and the other two were grilled by phone.

It appears as if this last trip to Santa Susana won't end in arrest, but the three remain nervous: "I don't really breathe until I get into an untowed car," Haefner says. Security personnel who happen upon suspicious-looking vehicles often just wait there for the owners to return. At the end of an earlier outing, Haeber and I were ambushed by a guard and a state trooper who—after questioning us—ordered us to leave and never return. But this time we're relieved to find Haefner's truck right where we left it, undisturbed in the brightening dawn. We change out of our filthy clothes and head to a 24-hour diner.

**I ASK THEM WHY THEY DO IT.** Why do they risk arrest, endanger their day jobs, and surrender nearly all their nights and weekends?

Haefner's girlfriend often asks the same thing, he replies with a laugh. But he can't shake the feeling he gets from these explorations. "It's surreal, like a waking dream. Space that's abandoned feels more intensely alone than the wilderness." Haeber chalks it up to curiosity: "It's like being a child and wondering what's beyond the next corner." Freskos has trouble defining his own motivations: "It's so intense and hard to explain."

They won't divulge which sites they're contemplating visiting next, at least not on the record. Haeber continually adds to a handcrafted map of 1,500 possibilities, sites he compiles by combing through the Internet, satellite imagery, and news stories. He *will* divulge the names of some dream destinations, including Portsmouth Naval Prison in Maine (once called the Alcatraz of the East), Building 257 on Plum Island in New York (where scientists secretly researched biological weapons), and the Hanford Site in Washington state (which once produced plutonium). All present huge obstacles, but the three try never to dismiss any site as impossible. The nuclear facility at Oak Ridge, Tennessee, which spends $150 million annually on security, was infiltrated in 2012 by three bolt-cutter-wielding peace activists—an octogenarian nun and her two senior-citizen accomplices.

Beyond the personal thrills, Haeber, Haefner, and Freskos feel their illegal hobby is a vital act of historical preservation. In this they draw inspiration from the WPA photographers who, during the 1930s, captured the few remaining pockets of America still stuck in the 19th century. The federal government does employ a few official documentarians, but they can get to only a small slice of all that needs chronicling.

"Where we are today, as a society, is a product of the Cold War mentality," Haeber says. "Exploration to me is taking a very local place, a single spot on the landscape, and connecting it to these big issues—national governments, politics, war, defense, consumption, cultural change, religion, societal change, how people interact with one another, why communities are the way they are." In Haeber's view, the Cold War's misguided premise (that one can defeat communist philosophy with nuclear missiles) lives on in the common belief that all problems are best solved by bigger and better technology. Not getting along with the nation next door? Upgrade your arsenal. With your neighbor? Webcam his misdeeds. With your God? Download a scripture-a-day app.

Indeed, the ultimate irony of their hobby is that the danger inherent in it—an omnipresent risk of arrest merely for the act of documenting historical structures, built at staggering taxpayer expense and long ago abandoned, their military purpose exhausted—is itself a holdover of the Cold War mentality, under which even modest transparency about military matters became forbidden in the name of "national security." Someday the federal government might come to its senses and open up its awe-inspiring Cold War legacy to the people who paid for it. Until then, though, we will have to content ourselves with these photographs.

## INSPIRED BY THE CLOUDS.

We looked to the sky and saw a different way to purify water. By vapor-distilling it, so it's pure and crisp like from a cloud, then adding electrolytes for a distinct taste. Oh, and we got some daydreaming done, too.

What will you see when you look up?

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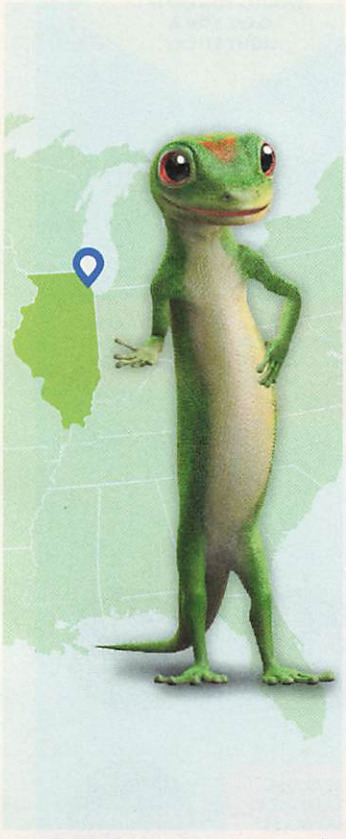

## GEICO GECKO'S DIGITAL NOMADIC JOURNEY

Each month the GEICO Gecko heads to the cities, neighborhoods, and streets across the USA where innovation is happening. Here at the corner of Avenue of Positive Change and Boulevard of Big Dreams, he finds some incredibly cool individuals doing incredibly cool things—and he shares every incredibly cool discovery via social media.

### Chicago: an architectural icon igniting technological change

Fifteen years ago, Chicago was considered a fly-over city for venture capitalists navigating between the growing tech hubs on the East and West coasts. Now, however, the Windy City has more than made up for lost time: There are more than 1,500 digital companies across this dynamic Midwestern capital and more than 40,000 people working at them. In 2012 alone, startups launched at the astounding rate of one per day (sometimes two).

Like the brilliant innovators and world-renowned architects behind the city's iconic skyline, these digital influencers are forging a new landscape with collaborative spaces and entrepreneurship programs.

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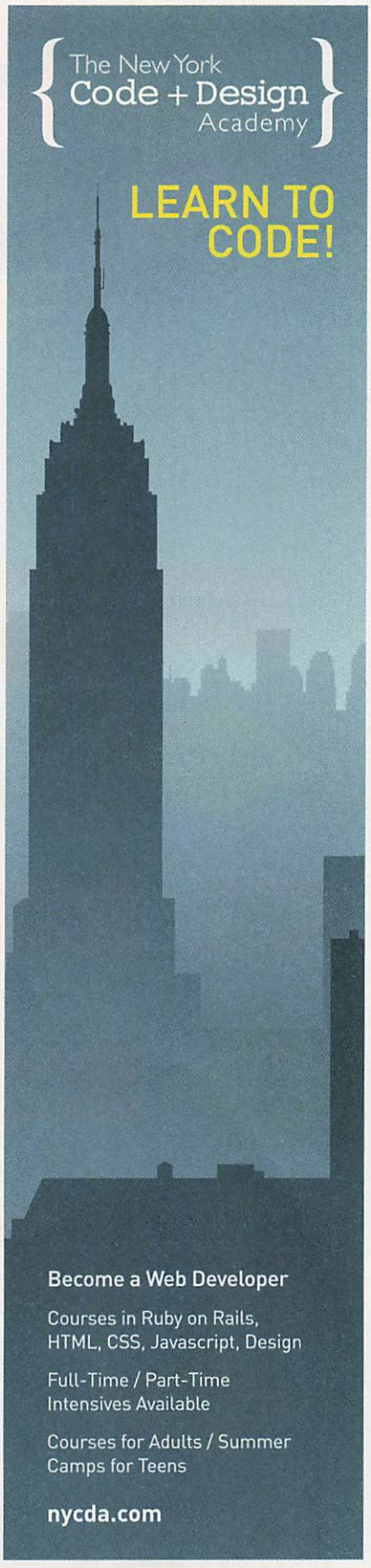

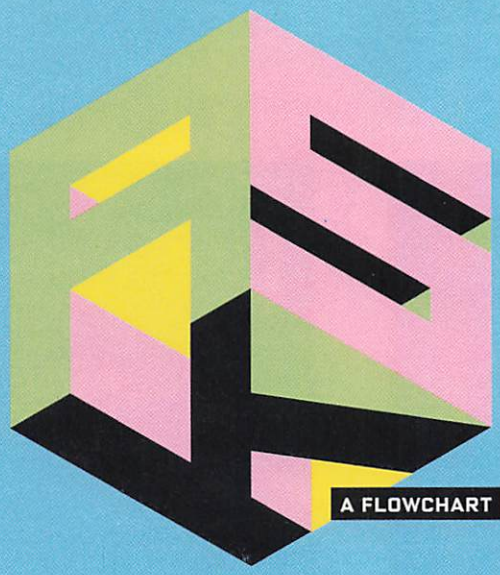


# WHAT ADULT SUMMER CAMP SHOULD I GO TO?

by Robert Capps

ARE YOU SMART OR COOL?

I'M COOLER THAN *YOU*.

BOTH, CLEARLY.

HOW, EXACTLY?

WITH THAT ATTITUDE I SHOULD SEND YOU STRAIGHT TO BURNING MAN.

I'M SMARTER THAN *YOU*.

DUDE, LOOK AT ME. I'M DRESSED AS A *STREET FIGHTER* CHARACTER!

DUDE, LOOK AT ME. I'M DRESSED AS A SITH!

WHATEVER, MAN.

PRETTY MUCH EVERY WAY. YOU'RE PRETTY DORKY.

PLEASE, ANYTHING BUT THAT!

ARE YOU A CEO?

TOKYO GAME SHOW

COMIC-CON

BONNAROO

FINE, WHAT WOULD YOU DO IF I GAVE YOU A LIGHT STICK?

NO, I ACTUALLY WORK FOR A LIVING.

OF COURSE.

OF A COMPANY WE'VE HEARD OF?

OH, YOU'VE HEARD OF ME.

YOU *WILL* HEAR OF ME!

WHAT DO YOU DO TO RELAX?

DRINK, MOSTLY.

SO YOU DON'T NEED TO NETWORK ANYMORE?

I DOUBT IT.

PUT IT IN MY MOUTH. OR RUB IT ALL OVER MY BODY... MAYBE BOTH.

TAKE IT APART TO SEE HOW IT WORKS.

WORK MORE.

SCREAM OBSCENITIES AT MIDWESTERN ADOLESCENTS ON XBOX LIVE.

PEOPLE NEED TO NETWORK WITH *ME*.

I'M GOING TO CHANGE THE WORLD!

DIFFERENT STROKES, I GUESS.

CAN IT HAPPEN NAKED?

HOW?

ELECTRIC DAISY CARNIVAL

ADULT SPACE CAMP

ANGELHACK HACKATHON

QUAKECON

HAZELDEN

IT BETTER!

BURNING MAN

BECAUSE IT ALREADY REVOLVES AROUND ME, OBVIOUSLY.

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